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The impact of recruit socioeconomic background and computer literacy on U.S. Navy Initial Training

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THE IMPACT OF RECRUIT SOCIOECONOMIC BACKGROUND AND COMPUTER LITERACY ON U.S. NAVY INITIAL TRAINING

by

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Advances in technology in the Navy, specifically its IT-21 initiative, and academic setback rates in high-tech ratings raises concern about the level of computer literacy in Navy accessions. This study examines household income data, computer, telephone, and on-line penetration rate data by socioeconomic level, student computer use data, and data from the DoD's Survey of Recruit Socioeconomic Background. These data were analyzed for relationships between recruit socioeconomic status (SES) background and computer literacy. Findings here show that individuals from lower socioeconomic strata have less access to computers and computer technology, and Navy accessions come from lower SES backgrounds. Therefore, they can be expected to have lower computer skills upon entering the Navy. This implies the Navy should consider adding basic computer/IT skills training at boot camp and follow-on computer and IT training at a Sailor's apprentice level ("A" school) training.

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THE IMPACT OF RECRUIT SOCIOECONOMIC BACKGROUND AND COMPUTER LITERACY ON U.S. NAVY INITIAL TRAINING

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ABSTRACT

Advances in technology in the Navy, specifically its IT-21 initiative, and academic setback rates in high-tech ratings raises concern about the level of computer literacy in Navy accessions. This study examines household income data, computer, telephone, and on-line penetration rate data by socioeconomic level, student computer use data, and data from the DoD's Survey of Recruit Socioeconomic Background. These data were analyzed for relationships between recruit socioeconomic status (SES) background and computer literacy. Findings here show that individuals from lower socioeconomic strata have less access to computers and computer technology, and Navy accessions come from lower SES backgrounds. Therefore, they can be expected to have lower computer skills upon entering the Navy. This implies the Navy should consider adding basic computer/IT skills training at boot camp and follow-on computer and IT training at a Sailor's apprentice level ("A" school) training.

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LIST OF ACRONYMS

AFQT	Armed Forces Qualification Test
AP	Advanced Placement
ASVAB	Armed Services Vocational Aptitude Battery
AVF	All-Volunteer Force
BUPERS	Bureau of Naval Personnel
C4I	Command, Control, Communications, Computers and Information
CD ROM	Compact Disk Read Only Memory
CIO	Chief Information Officer
CNET	Chief of Naval Education and Training
CNO	Chief of Naval Operations
CPS	Current Population Survey
CPU	Central Processing Unit
CS	Coding Speed
DC	Damage Controlman
DMDC	Defense Manpower Data Center
DMDCEAST	Defense Manpower Data Center, East Coast
DoD POPREP	Department of Defense *Population Representation in the Military*
DoD	Department of Defense
DoN	Department of the Navy
EM	Electrician's Mate
EN	Engineman
ET	Electronics Technician
FAX	Facsimile
FC	Fire Controlman
FY	Fiscal Year
GM	Gunner's Mate
GSE	Gas Turbine Systems Technician, Electrician
GSM	Gas Turbine Systems Technician, Maintainer
HSDG	High School Diploma Graduate
HT	Hull Maintenance Technician
I/O	Input/Output
IA	Information Assurance
IC	Interior Communication Electrician
IMT	Information Management Technology
IPT	Integrated Product Team
IT	Information Technology
LAN	Local Area Network
MCSE	Microsoft Certified Systems Engineer
MK	Mathematics Knowledge
MN	Mineman
MR	Machinery Repairman

NPS	Naval Postgraduate School
NTIA	National Telecommunications Information Administration
OJT	On the Job Training
OM	Opticalman
OS	Operating System
OSD	Office of the Secretary of Defense
OSI	Open Systems Interconnection
PC	Paragraph Comprehension
PC	Personal Computer
PN	Personnelman
PSA	Personnel Support Activity
PSD	Personnel Support Detachment
RF	Radio Frequency
RM	Radioman
RTC	Recruit Training Command
SEI	Socioeconomic Indicator
SES	Socioeconomic Status
SM	Signalman
SRB	Selective Reenlistment Bonus
SSC	Service School Command
TM	Torpedoman's Mate
TSEI	Total Socioeconomic Indicator
USN	United States Navy
VE	Verbal
VTC	Video Teleconferencing
WAN	Wide Area Network
WK	Word Knowledge
XO	Executive Officer
YN	Yeoman

I. INTRODUCTION

> It is estimated that 60 percent of jobs created in the year 2000 will require skills possessed by only 20 percent of workers today. An investment in computer education today is essential to American competitiveness in the future (Shea, 1996).

The Navy must adapt to advances in Information Technology (IT) and make the most of them if it is to meet it's responsibilities for leadership among the world's military organizations. These adaptations must not be limited to equipment acquisition. In order to be successful with Network Centric Warfare and Information Warfare the Navy must invest in what VADM Cebrowski terms its "most vital asset" – the young people the Navy is recruiting. Without the right people to operate, maintain, deploy, and command the naval force materiel assets, investment in these assets will return far less than what is intended and may, in fact, be wasted.

People in lower economic strata have less computer access. Less computer access inhibits computer literacy. The U.S. Navy recruits largely from lower economic strata. Ergo, the U.S. Navy is recruiting from a population base that is less computer savvy. The hi-tech apprentice level Navy schools ("A" school) receive these individuals from recruit training where they receive no computer skills or IT related training. These schools, in turn, see a high academic setback rate because students do not grasp the technological materials being taught.

This study compared household income data from the U.S. Bureau of the Census, computer, telephone, and on-line penetration rate data by socioeconomic level from the

U.S. Commerce Department, and student computer use data from the U.S. Bureau of the Census and the U.S. Department of Education with data from the Department of Defense's Survey of Recruit Socioeconomic Background. From this research, conclusions were drawn about the socioeconomic background and expected computer literacy of U.S. Navy accessions. Implications for basic computer/IT skills training for the Navy at boot camp and follow-on computer and IT training at a Sailor's apprentice level ("A" school) training were also assessed.

II. LITERATURE REVIEW

A. INTRODUCTION

It might be supposed that information technology is a "neutral" concept characterized by universalistic applicability to everyone regardless of personal attributes, other than ability. However, many writers consider information technology (IT) to be anything but neutral when it comes to discrimination and bias issues. The reality is that computer technology, in spite of its potential, more often reinforces existing patterns of social bias than it alleviates them. Although overt discrimination is not a problem, serious issues exist in the area of race and class bias.

B. COMPUTERS AND RACIAL BIAS

Race and ethnicity have been linked to less favorable attitudes toward, and less experience with, computers (Badagliacco, 1990). It is charged plausibly that wealthy school districts may familiarize white students more with computers than can be done in inner city districts populated by minority ethnic groups. In this way, computerization may be exacerbating cultural differentials in America (Ibrahim, 1985). Dutton et al. (1987) have found that formal education, which is significantly lower among minorities, is a strong factor in explaining the adoption and use of computers in the home. Race also appears as a correlate of computing experience in other studies (e.g., Gattiker and Nelligan, 1988; Platter, 1988).

Racial effects can become self-perpetuating. "The fact that computer-related activities are seen as white and male may influence and discourage women and minorities

from making an academic commitment to careers for which high-technology skills are essential," Badagliacco (1990) writes. Badagliacco's study of 1,420 students found that computer experience varied with ethnicity, with Hispanics having the least. Correspondingly, attitudes toward computers vary by race and ethnicity. The result, she warns, may be a formation of a "technological underclass" of women and minority workers who are disadvantaged in terms of computer technology.

The effects of gender, class, and race are cumulative; so that disadvantaged status in two or three categories is worse than disadvantaged status in any one. Thus, poor black women are the most disadvantaged in computing (Frenkel, 1990). Chambers and Clarke (1987) also found that the effects of ethnicity, socioeconomic status, gender, and school ability disadvantages were cumulative. More disadvantaged students participated less in class computing, gained lower computing knowledge, and had less positive attitudes toward computing. That is, computing increased rather than reduced inequities. The relative lack of computer use by disadvantaged children is particularly regrettable in view of studies which show computing can be effective in matching black children's learning styles and the curriculum (Schubert, 1986).

C. COMPUTING AND SOCIAL CLASS DIFFERENTIALS

It is not cheap to have a computer in the home. Similarly, private and affluent schools are more likely to emphasize computing. Wealthier school districts, usually serving higher socioeconomic status families, routinely provide greater computer access (Johnson, 1982; Lacina, 1983). Kohl and Harman (1986), while documenting gender differentials in computing, have found economic causes to constitute the greater barrier.

Computer use in education declines dramatically when students are from families with low socioeconomic status (Becker, 1983; McGee, 1987; Congress, 1995).

Race and ethnicity, of course, correlate with socioeconomic status. Badagliacco and Tannenbaum (1989) found that ethnicity was correlated with computer experience and attitudes at an American college: whites have the most experience and favorable attitudes; Hispanics have the least, after controlling for gender and number of credit hours. Furthermore, a study conducted by the U.S. Commerce Department, National Telecommunications and Information Administration (1998), found a widening gap in computer ownership and overall usage between Americans at upper and lower income levels and that blacks and Hispanics lag even further behind whites in their level of PC ownership and on-line access than they did in 1994. Should these disparities continue to persist and to the extent that home computers are used in learning activities outside of schools, access to technology is likely to become another element that causes a student's educational attainment to be highly correlated with the socioeconomic status of his or her family.

During the 1980s, over a billion dollars was invested in helping public schools compete technologically. As a result, sharp class and racial disparities noted early in the decade seemed to have largely disappeared by 1989. A sharp narrowing of disparities between the rich and the poor and between public and private schools seemed to demonstrate that great progress had been made (Piller, 1992). However, closer investigation shows that even when inner city and rural school districts in poor neighborhoods have computers, skills and resources to maintain and make use of this

equipment is commonly lacking (Piller, 1992; Irving, 1998). One journalist concluded, "For every technological success story, impoverished schools suffer a hundred setbacks. The links between a generation of American students and the technological future grow increasingly tenuous" (Piller, 1992).

D. ENSURING EQUITY

Those who are skeptical about the potential for technology to help reinvent schools fear that technology will benefit only the wealthy schools and therefore will widen the gap between the haves and have-nots. The fact is that information technologies can transform education and learning for any student, regardless of their socioeconomic status. But the problem is that for a majority of lower income, disadvantaged schoolchildren, such a transformation is not in the foreseeable future. The issue is not that all poorer schools do not have computers, but rather they lack the funds to maintain hardware and upgrade software so computers sit broken down in labs and closets. These basic inequities in school funding lead to vast inequities in access to education technology. (Ellmore et al., 1995; Microsoft, 1998)

Government plays an important role in helping to ensure access to new technologies and ultimately equity (Glennan, 1996). It can set legislation to help pay for hardware for disadvantages schools, educate teachers, and link schools to computer networks. For example, the Universal Service Fund, or "e-rate" program, was established by the federal government in 1996 to assist schools unable to afford connectivity to the Internet for its constituents (Abramson, 1998). But only a total, outright commitment by

the public and by all levels of the educational system can ensure equity (Ellmore et al., 1995).

Inequality of educational opportunity based on socioeconomic differentials between school districts characterizes our country. Schiller (1996) cites two examples: in 1994 the richest Michigan school districts spent about $10,000 per student and the poorest $3,200; the richest New York districts spent almost $46,000 per student but the New York City districts averaged $6,644. Today, similar inequalities exist in access to information technologies. Students in poorer school districts are ill prepared for what they will encounter in their working lives and they are not gaining the expertise necessary to compete and win in the high-tech workplace of the 21st century (Abramson, 1998). If all schools were given equal access, then the playing field, in essence, would be level for our children nationwide. We would be empowering everyone to excel.

E. INVESTING IN TEACHERS

Merely setting up computers and networks in classrooms is not enough to ensure students the full benefits of technology. Technology is only effective and useful in the classroom when you not only have the funds to support and maintain it, but also when you have the teachers who know how to integrate the technology into their daily classroom lesson plans (Congress, 1997). Thus, the key to effective use of technologies is teacher training. Technology-savvy teachers are able to provide their students with meaningful, engaged learning experiences and opportunities to interact with a wealth of resources, materials, and data sets. They use technologies such as the Internet, distance learning, CD-ROMs, and video to help students achieve challenging educational

standards (Microsoft, 1998). This type of computer use in the classroom demands that a teacher be excited about the technology, innovative, energetic, and resourceful enough to imagine the possibilities about a lesson and transform the factory model, lecture style classroom (Congress, 1997). In the absence of adequate, high quality professional development, teachers can not provide students with those opportunities.

Overall, teachers receive less technical support than does any other group of professionals (Ellmore et al., 1995). The continued professional development of teachers is woefully inadequate. Schools, public and private, must provide comprehensive, ongoing professional development opportunities for all teachers and staff. Teachers and staff must have knowledge of and experience with a vast range of educational technology equipment and its applications. They must also learn strategies for using it effectively in the classroom. If teachers are to become comfortable with the technologies with which they will be teaching and that will reshape schools, they must receive adequate preservice training during their college years and inservice training during their careers (Congress, 1995). This means providing teachers with the necessary workshops, summer sessions, and time off from work to learn how to incorporate technology in the classroom (Glennan, 1996; Congress, 1995; Congress 1997; Ellmore et al., 1995). For technology to succeed in the classroom, as much support, time and money must be invested in teachers as is invested in the hardware and software (Congress, 1997).

One of the most significant difficulties with the integration of technology into K-12 schools is the resistance by teachers to accept and use technology in their regular classes (Congress, 1997). Teachers tend to teach as they were taught. Most have not

been taught in a technologically advanced classroom where computers are used as a major part of the curriculum. They are uncomfortable with the unknown and don't know how to get started. This is where support and investment in technological professional development for teachers is most important.

Today, many students still attend factory model schools. Much of the day is spent passively listening to lectures given by the teacher. Technology simply added to this type of setting can be very uninspiring and is often used for drills, word processing, and remedial work (Ellmore et al., 1995). However, teachers taking full advantage of the interactive capabilities of today's information technologies turn these electronic babysitters into effective learning machines. Teachers who have a wealth of knowledge and experience in effectively incorporating computers into their classroom change from being a repository of all knowledge to being guides or mentors who help students navigate through information made available by technology and interactive communications (Congress, 1995, Ellmore et al., 1995).

III. METHODOLOGY

A. RESEARCH FOCUS AND APPROACH

1. Research Focus

The focus of this research is to identify and evaluate the current state of computer literacy among Navy enlisted recruits. In doing so, I searched for information currently available regarding computers in education (K-12) and how, if at all, the use and availability of computers in education differs among socioeconomic classes. Particular attention was paid to the existing gap (inequality) in educational opportunities between children who are from more affluent families and neighborhoods and those who are not: the haves and have-nots. This information was used, along with socioeconomic and demographic data of Navy recruits, to form conclusions about the state of computer literacy of the Navy's enlisted recruit base.

2. Research Approach

Most of this research was archival research and was conducted by searching the Internet for sources related to computer use in education, ensuring equity, and socioeconomic status. The electronic catalogs of the White House, the Database AskEric, Amazon.com, Lexis-Nexis and the Dudley Knox Library BOSUN System were reviewed for literature on computers in education and socioeconomic stratification.

B. FINDING THE NAVY RELEVANT INFORMATION

To obtain information on Navy recruits' computer literacy and their socioeconomic background, telephone calls, emails, and faxes were made to relevant Navy sources and searches on Navy related Web pages were conducted. The Navy does not match data regarding recruit computer literacy with socioeconomic background. This effort looked for the pertinent data and, with the appropriate assumptions, made the appropriate inferences and conclusions. The Defense Manpower Data Center (DMDC), Monterey Bay, was contacted to obtain information on Navy recruit demographics, specifically socioeconomic status. The information required is kept in an annual *Population Representation in the Military Services* report in the East Coast office, DMDCEAST. Report data from fiscal years 1992-1996 were obtained from DMDCEAST.

Collecting recruit computer literacy data was a bit more difficult because the Navy does not maintain any hard statistics on this characteristic, thus, the only data available was anecdotal or inferential. The Executive Officer (XO) of the Service School Command (SSC), Great Lakes, Illinois, who also was a former XO of the Recruit Training Command (RTC), was contacted for data on recruit computer literacy. The SSC provides approximately 70 percent of the surface Navy's initial technical training, including apprentice level schools ("A" school) for the MM, EN, EM, IC, GSM, GSE, HT, DC, MR, SM, RM, OM, ET, FC, GM, and TM ratings. The XO stated that only the RM "A" school would be helpful because the rest of the schools do not teach or use computers; therefore, they are not concerned with the student's computer literacy.

The RM "A" school is a 14-week curriculum where students progress from basic computer technology to the most sophisticated communication systems. Radiomen transfer information with state-of-the-art multi-media technology and commercial satellites on a global basis; operate, manage and provide hardware and software support to mainframes, mini, and microcomputers, Local Area Networks (LAN's), Wide Area Networks (WAN's), and telecommunications systems; apply diagnostic and restoral techniques utilizing electronic and operational system theory; advise on equipment capabilities, limitations, and condition; implement production control procedures including input/output quality control support; implement and monitor security procedures; and maintain and repair mission organizational level Command, Control, Communications, Computer, and Intelligence Systems (C4I). The senior chief in charge of this curriculum was asked the following questions:

- What is taught in RM "A" school?
- Is computer experience a prerequisite?
- How many students per class?
- What percentage have any computer experience?
- Do those without basic computer skills have difficulty with the material being taught?
- What basic computer skills are taught at your school?
- Would a basic computer skills course before entering RM "A" school be beneficial?

Additional material in response to these questions was received via fax.

The YN/PN (Yeoman/Personnelman) "A" school in Meridian, Mississippi, was also contacted since these ratings deal with Navy administration and media, which is highly automated. The same questions as listed above were asked of the senior coordinator of this school. A recent graduate of the YN school, now assigned to the Personnel Support Activity, Monterey was asked:

- What computer skills are taught at YN "A" school?
- What is taught there?
- Where did you learn about the common/universal software applications used at PSDs/PSAs throughout the navy?
- What computer skills did you have when you entered the Navy?
- Where did you learn the computer skills necessary for your job?

Internet searches were also conducted on Navy Web sites, such as the Bureau of Naval Personnel (BUPERS) homepage, to obtain additional Navy demographic data and some specifics about the RM, YN and PN ratings.

C. SELECTING STUDIES FOR REVIEW

An on-line search reported thousands of hits for combinations of the key words 'computers, equity, socioeconomic status, education, technology, haves, have-nots, economic class, or information technology' as applied to computer education in grades K-12. Numerous attempts were made, to no avail, to narrow the search so as not to receive so many hits. Since it would have been impractical to go through the thousands of on-line hits, almost all of them were cursorily scanned. Those documents that appeared to have relevance to this study were opened. Thereby, thousands of hits were

excluded immediately. Most entries identified in this search were published journal articles.

To identify books on this subject, Amazon.com's on-line database was searched using similar and-or Boolean combinations as used for periodicals. A total of 64 items were found. This selection was reduced to five books. Three of them were excluded as lacking relevance to this study (they had attractive titles that actually dealt with other issues). The reference lists in the remaining two books, in turn, identified an additional 17 journal articles and one book. These 19 items (journal articles found using Lexis-Nexis) all contained empirical studies on computer education equity conducted between 1982 and 1992.

Further searches were conducted on the Dudley Knox BOSUN system and Lexis-Nexis. Fifty-one books were reviewed from the Dudley Knox library with four containing relevant information and 30 newspaper and journal articles were found using Lexis-Nexis with 16 being useful.

These efforts yielded forty-eight books, newspaper and journal articles, government reports, and Web sites reporting empirical studies or having relevant information regarding education, equity, computer technology, and Navy recruit socioeconomic information and computer literacy. While it is possible that this search did not discover every study or document on the subject of computer education and economic stratification, the resulting references appear sufficiently comprehensive.

IV. FINDINGS

A. ECONOMIC STRATIFICATION IN THE UNITED STATES

A portrait of American incomes provides the clearest picture of both our country's rich and poor and the path those sectors are following (See Table 1). In September of 1998, the Census Bureau reported that the gap between the richest Americans and all others is the widest it has been since the end of World War II (U. S. Census Bureau,

Table 1. **Selected Measures of Household Income Dispersions: 1967 to 1997**

[Income in 1997 dollars]

Measures of income dispersion	1997	1996	1995[1]	1990	1985	1980[2]	1975[3]	1970	1968	1967
HOUSEHOLD INCOME AT SELECTED PERCENTILES										
20th percentile upper limit ($)	15,400	15,107	15,165	15,350	14,916	14,736	14,351	14,328	14,147	13,264
50th (median) ($)	37,005	36,306	35,887	36,770	35,229	34,538	33,699	33,942	32,964	31,583
80th percentile upper limit ($)	71,500	69,576	68,585	67,792	65,347	61,821	58,534	56,976	54,017	52,355
95th percentile lower limit ($)	126,550	122,283	119,006	116,351	109,282	100,434	93,333	90,074	84,507	84,008
HOUSEHOLD INCOME RATIOS OF SELECTED PERCENTILES										
95th/20th	8.22	8.09	7.85	7.58	7.33	6.82	6.5	6.29	5.97	6.33
95th/50th	3.42	3.37	3.32	3.16	3.1	2.91	2.77	2.65	2.56	2.66
80th/50th	1.93	1.92	1.91	1.84	1.85	1.79	1.74	1.68	1.64	1.66
80th/20th	4.64	4.61	4.52	4.42	4.38	4.2	4.08	3.98	3.82	3.95
20th/50th	0.42	0.42	0.42	0.42	0.42	0.43	0.43	0.42	0.43	0.42
MEAN HOUSEHOLD INCOME OF QUINTILES										
Lowest quintile ($)	8,872	8,793	8,794	8,835	8,647	8,743	8,665	7,885	7,799	7,189
Second quintile ($)	22,098	21,581	21,481	22,141	21,375	21,099	20,574	20,966	20,614	19,600
Third quintile ($)	37,177	36,300	35,919	36,571	35,404	34,727	33,662	33,763	32,692	31,295
Fourth quintile ($)	57,582	56,182	55,216	55,139	53,242	51,132	48,884	47,594	45,608	43,786
Highest quintile ($)	122,764	118,164	115,226	107,004	98,211	89,812	85,131	84,268	79,875	79,348
SHARES OF HOUSEHOLD INCOME OF QUINTILES										
Lowest quintile	3.6	3.7	3.7	3.9	4.0	4.3	4.4	4.1	4.2	4.0
Second quintile	8.9	9.0	9.1	9.6	9.7	10.3	10.5	10.8	11.1	10.8
Third quintile	15.0	15.1	15.2	15.9	16.3	16.9	17.1	17.4	17.5	17.3
Fourth quintile	23.2	23.3	23.3	24.0	24.6	24.9	24.8	24.5	24.4	24.2
Highest quintile	49.4	49.0	48.7	46.6	45.3	43.7	43.2	43.3	42.8	43.8
Gini coefficient of income inequality	0.459	0.455	0.45	0.428	0.419	0.403	0.397	0.394	0.388	0.399

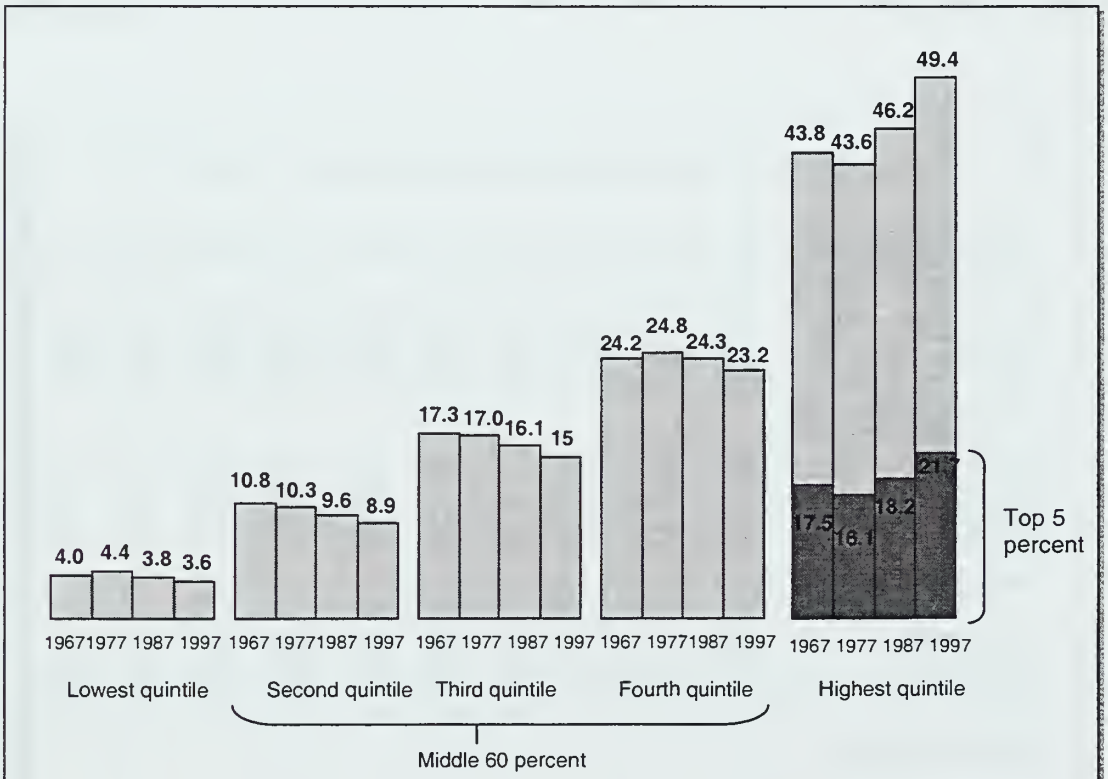
[1]Reflects 1990 census population controls first implemented in 1993, 1990 census sample redesign, a change in data collection method from paper-pencil to computer-assisted interviewing (CAI), and changes in income reporting limits. For detailed information concerning the impact of these changes, see Current Population Reports, Series P60-191, "*A Brief Look at Postwar U.S. Income Inequality.*"

[2]Reflects 1980 census population controls first implemented in March 1980.

[3]Reflects 1970 census population controls first implemented in March 1972.

Source: U.S. Bureau of the Census, March Current Population Survey. Data not available prior to 1967.

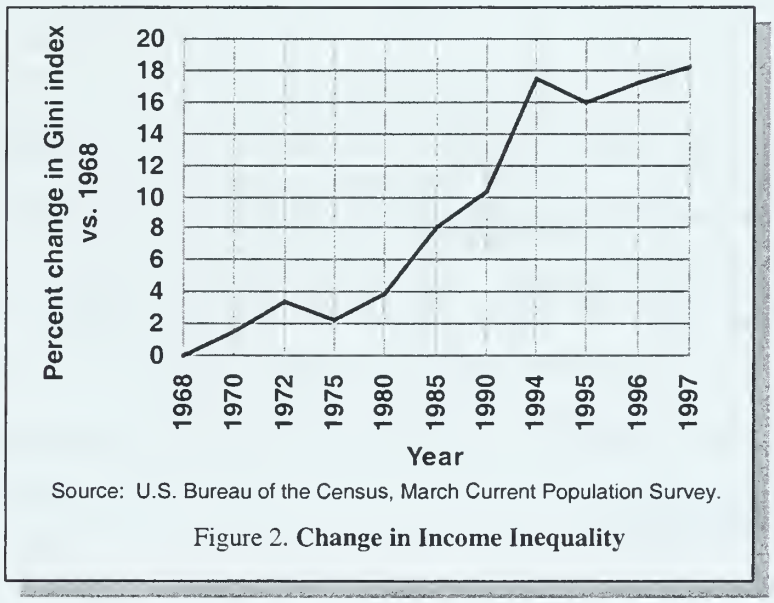
1998). Adjusted for inflation, since 1967 to 1997 the richest 5 percent of American households (those with household incomes above $126,550 in 1997) have experienced a 24 percent aggregate household income increase while the bottom 60 percent (those with household incomes below $46,000 for 1997) have seen average aggregate household income drop by 14 percent (See Figure 1).



Source: U.S. Bureau of the Census, March Current Population Survey

Figure 1. **Share of Aggregate Household Income by Quintile: 1967, 1977, 1987, 1997**

The Census Bureau has been studying the distribution of income since the late 1940's. The most commonly used measure of income inequality is the Gini index. The Gini index ranges from 0.0, when every family (household) has the same income, to 1.0, when one family (household) has all the income. It is, therefore, one way to measure how far a given income distribution is from equality (Weinberg, 1996). The Census Bureau began reporting the income distribution of households in 1967. By coincidence, 1968 was the year in which measured postwar income was the most equal for households (See Figure 2). The Gini index for households indicates that there has been growing



Source: U.S. Bureau of the Census, March Current Population Survey.

Figure 2. **Change in Income Inequality**

income inequality over the past quarter century. Inequality grew slowly in the 1970's and rapidly during the early 1980's. From about 1987 through 1992, the growth in measured inequality seemed to taper off, reaching 12 percent above its 1968 level. This was then followed by a large apparent jump in 1993, partly due to a change in survey

methodology (Weinberg, 1996). The Gini index for households in 1997 was 18 percent above its 1968 level.

The two measures illustrated in Figures 1 and 2 indicate the long-term trend has been toward increasing income inequality. Increasing income inequality is believed to be related to changes taking place in the Nation's labor market and, to a certain extent, the composition of its households. The wage distribution has become considerably more unequal with workers at the top experiencing real wage gains and those at the bottom real wage losses. These changes reflect relative shifts in demand for labor differentiated on the basis of education and skill. At the same time, long run changes in society's living arrangements have taken place, also tending to exacerbate household income differences. For example, divorces, marital separations, births out of wedlock, and the increasing age at first marriage have led to a shift away from married-couple households to single-parent families and non-family households. Since non-married couple households tend to have lower income and incomes that are less equally distributed than other types of households, changes in household composition have been associated with growing income inequality.

Two other ways to look at the change in inequality examines the income at selected positions in the income distribution and the average (mean) household income in each quintile (See Figures 3 and 4). As Figure 3 shows, in 1997 dollars the household at the 95th percentile in 1997 had $126,550 in income, 8 times that of the household at the 20th percentile, whose income was $15,400. In contrast, in 1968, the household at the 95th percentile had but 6 times the income of the household at the 20th percentile. In

Figure 4, the average income of households in the top quintile grew from $79,875 in 1968 to $115,226 in 1995 and $122,764 in 1997. In percentage terms, this growth was 44 percent from 1968 to 1995 and 54 percent from 1968 to 1997. During the 1968 to 1997 period, the average income in the bottom quintile grew by only 14 percent, from $7,799 to $ 8,872 and 13 percent from 1968 to 1995. Consequently, the ratio of the average income of the top 20 percent of households to the average income of the bottom 20 percent went from 10 in 1968 to 13 in 1995 to 14 in 1997. In sum, when money income

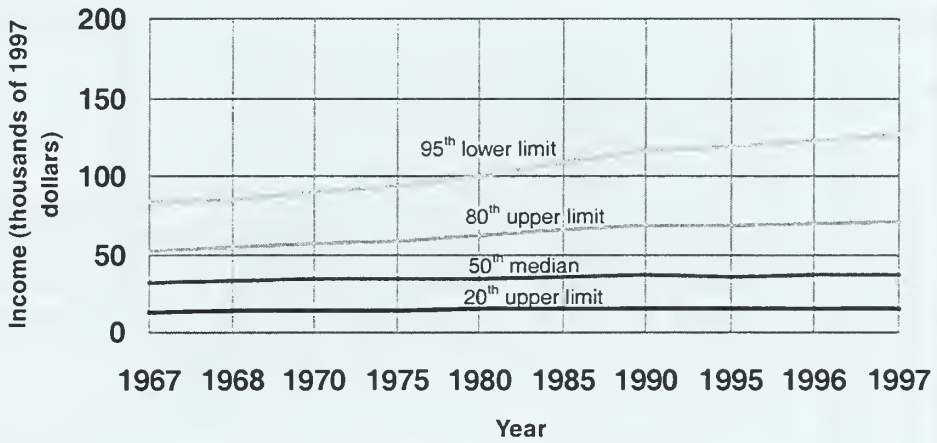
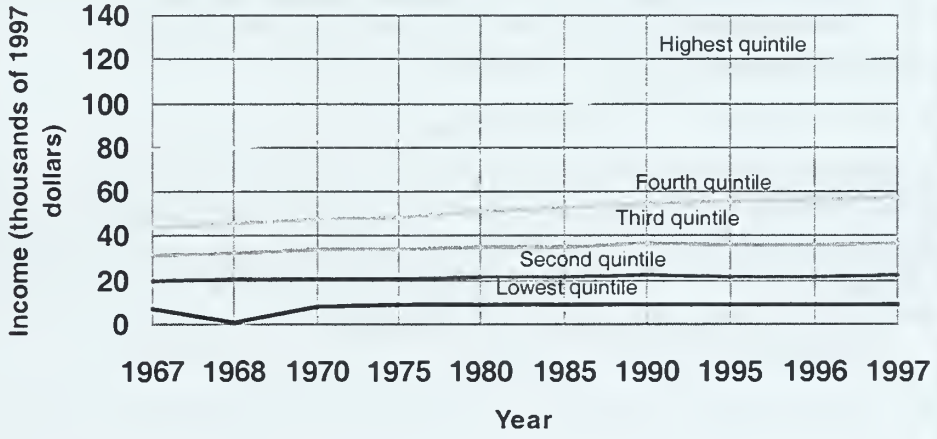


Figure 3. **Household Income at Selected Percentiles**



Source: U.S. Bureau of the Census, March Current Population Survey.

Figure 4. **Mean Household Income**

is examined, each of these indicators shows increasing income inequality over the 1968 to 1997 period.

B. ACCESS TO COMPUTERS

The poorest Americans not only have the smallest share of American wealth, but they have the most limited access to computers as well (U.S. Commerce Department, 1998). Computers and computer technology are putting a premium on computer skills. The proliferation of the Information Superhighway is further increasing this need. As our current Vice President of the United States warns:

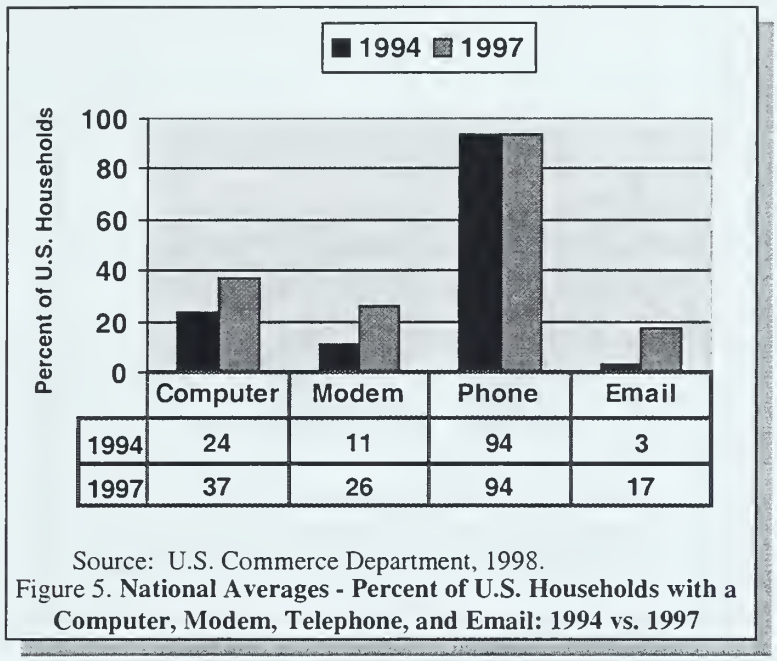
> If only some parts of America have access to the Information Superhighway, technology will drive us apart, just as surely as an axe splits a tree. As computers increase society's capabilities, those without access to them will be left further and further behind. In short, we risk becoming a society of 'haves' and 'have-nots' (Gore, 1996).

It is interesting that he warns of our society becoming one of "haves" and "have-nots" when we have already past that point. That computers may increase societal stratification is especially troublesome. The Vice President continues:

> In the next century, Americans without basic computer skills will be unemployable in the world's largest and most profitable economic sector. Indeed, every sector in the world is adapting with new information technologies – and that means employees must be able to use computers and navigate information networks (Gore, 1996).

1. Persisting Digital Divide

Americans have increasingly embraced the Information Age through electronic access in their homes. 1997 nationwide data gathered by the Census Bureau for the Department of Commerce's National Telecommunications Information Administration (NTIA) shows the following nationwide penetration rates: 94% for telephones, 37% for personal computers (PCs), 26% for modems, and 17% for online access (See Figure 5).



	Computer	Modem	Phone	Email
1994	24	11	94	3
1997	37	26	94	17

Source: U.S. Commerce Department, 1998.

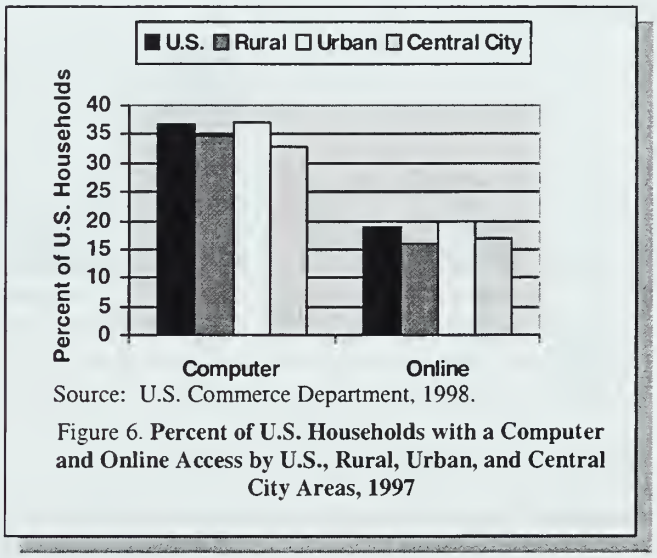
Figure 5. **National Averages - Percent of U.S. Households with a Computer, Modem, Telephone, and Email: 1994 vs. 1997**

Compared to the 1994 data, the nationwide telephone penetration has remained unchanged. The computer penetration rate, however, has grown substantially in the last three years: PC ownership has increased 51%, modem ownership has grown 139%, and email access has expanded by 397%. Despite this significant growth in computer ownership and overall usage, the growth has occurred to a greater extent within some income levels, demographic groups, and geographic areas, than in others. In fact, the

digital divide between certain groups of Americans has increased between 1994 and 1997 so that there is now an even greater disparity in penetration levels among some groups.

a. PC Ownership and Online Access

Although PC ownership has grown by 10-13 percentage points in all areas since 1994, central cities lag behind the national average for PC ownership (33%) and online access (17%), as do rural areas with 35% PC ownership and 16% online access (See Figure 6).



Source: U.S. Commerce Department, 1998.

Figure 6. **Percent of U.S. Households with a Computer and Online Access by U.S., Rural, Urban, and Central City Areas, 1997**

Like any fairly expensive commodity, the computer is most common in the wealthiest households. Households with income over $75,000, making up a mere 10% of households, account for 76% of computer ownership and 49% online access rates (See Tables 2 and 3). Households below $35,000 in annual income all have PC and online access levels below the national average as shown in Figure 5. Additionally, rural households earning between $5,000 - $10,000 account for the lowest penetration rate for

PCs (8%) and online access (2%). As the tables below show, there is a positive correlation between income and both possession of a computer and having online access.

Table 2. **Percent of U.S. Households with a Computer by Income and by U.S., Rural, Urban, and Central City Areas, 1997**

	U.S.	Rural	Urban	Central City
Under $5,000	17	15	17	16
5,000-9,999	10	8	11	11
10,000-14,999	13	11	14	13
15,000-19,999	17	17	18	18
20,000-24,999	23	21	24	24
25,000-34,999	32	32	32	31
35,000-49,999	46	45	46	46
50,000-74,999	61	60	61	60
75,000+	76	75	76	74

Table 3. **Percent of U.S. Households with Online Service by Income and by U.S., Rural, Urban, and Central City Areas, 1997**

	U.S.	Rural	Urban	Central City
Under $5,000	7	6	8	7
5,000-9,999	4	2	4	5
10,000-14,999	5	3	6	6
15,000-19,999	7	5	8	10
20,000-24,999	9	7	10	10
25,000-34,999	14	12	15	13
35,000-49,999	21	16	23	23
50,000-74,999	32	28	34	35
75,000+	49	44	50	49

Source: U.S. Department of Commerce, 1998.

Of course, this fact would be inconsequential if the object in question did not provide its users with both skills and opportunity. In contrast, a stereo, a microwave oven or a recliner chair does little to improve the education or future income of the individuals who use such objects. Having computer skills and access to information technology (IT) opens the door to better paying jobs. Among the best paying jobs in the country are high-

tech jobs. They pay approximately 73 percent higher than the average private sector wage (Abramson, 1998). The demonstrated relation between income and computer ownership is especially troubling because it creates and unequal playing field for our children.

Most of children in poverty do not have computers at home; as computers become more crucial in learning and work, these children are in the most danger of being left in the technological dust. Furthermore, an element of stratification not reflected in the graph is the quality of the computers owned. Computers are a product where newness and the technological frontier are king. It is not just having a computer; it's having the right computer. The benefits to be reaped from a $3,000 Pentium II PC running Windows 98 are far greater and more valuable than from an Apple IIe made seventeen years ago. The computer promises great rewards (Ellmore et al., 1995). Today those rewards are falling to the wealthiest of families. Although all income groups are now more likely to own a computer, the penetration levels for those at higher incomes has grown more significantly. As a result, the gap in computer ownership levels between higher and lower income households is expanding. For example, the 1997 difference in PC ownership levels between households earning $10,000 - $14,999 and those earning $50,000 - $74,999 was 48 percentage points, up from 38 percentage points in 1994 (U.S. Commerce Department, 1998).

The divide among races is even more striking for PC ownership and online access. While PC ownership has grown most significantly for minority groups since 1994, blacks and Hispanics still lag far behind the national average. White households

are still more than twice as likely (41%) to own a computer than black (19%) or Hispanic (19%) households (See Table 4). This divide is apparent across all income levels; even at

Table 4. **Percent of U.S. Households with a Computer by Race/Origin and by U.S., Rural. Urban, and Central City Regions, 1997**

	U.S.	Rural	Urban	Central City
White Not Hispanic	41	37	43	42
Black Not Hispanic	19	15	20	17
Other Not Hispanic	47	36	48	44
Hispanic	19	19	19	16

Table 5. **Percent of U.S. Households with Online Service by Race/Origin and by U.S., Rural. Urban, and Central City Regions, 1997**

	U.S.	Rural	Urban	Central City
White Not Hispanic	21	16	24	23
Black Not Hispanic	8	6	8	6
Other Not Hispanic	25	16	26	24
Hispanic	9	7	9	7

Source: U.S. Department of Commerce, 1998.

incomes higher than $75,000, whites are more likely to have PCs (76%) than are blacks (64%) (U.S. Commerce Department, 1998). Similarly, the rates for online access are nearly three times as high for whites (21%) as for blacks (8%) or Hispanics (9%) (See Table 5). Significantly, the digital divide between racial groups in PC ownership has increased since 1994. In 1997, the difference in PC ownership levels between white and black households was 22 percentage points, up from 17 percentage points in 1994. Similarly, the gap in PC ownership rates between white and Hispanic households in 1997 has increased to 21 percentage points, up from 15 percentage points in 1994. This gap has increased at almost all income levels, including at incomes above $75,000, where

some might have expected computer ownership rates to converge. (U.S. Commerce Department, 1998)

The level of education affects PC and online penetration rates much as income; the greater one's education, the greater the likelihood that the person has a PC or a modem. The comparison is striking with respect to PC ownership. Those with a college education are ten times more likely to own a computer as those without any high school (U.S. – 63% versus 7%). As shown in Table 6, the difference in PC ownership by

Table 6. **Percent of U.S. Households with a Computer by Educational Attainment and by U.S., Rural. Urban, and Central City Regions, 1997**

	U.S.	Rural	Urban	Central City
Elementary	7	5	7	6
Some High School	11	12	10	8
H.S. Diploma or GE	36	30	24	20
Some College	43	45	43	39
B.A. or more	63	65	63	60

Table 7. **Percent of U.S. Households withOnline Service by Educational Attainment and by U.S., Rural. Urban, and Central City Regions, 1997**

	U.S.	Rural	Urban	Central City
Elementary	2	1	2	2
Some High School	3	3	3	3
H.S. Diploma or GE	10	9	10	8
Some College	22	21	22	20
B.A. or more	38	36	39	36

Source: U.S. Department of Commerce, 1998.

education attainment is even more distinct in rural areas (65% with a BA or more versus 5% with no high school). Even more striking are the differences in Table 7 that depict online access by education attainment. For households with a college degree, 38% have

online access, for households with a high school diploma only 10% have online access, and a mere 2% have access for households without any high school education.

b. Telephone Penetration Rates

With the growing importance of the Internet and the World Wide Web, not only is the type of computer important, but it is important to have the ability to access the Internet. In the poorest neighborhoods of America, the situation is bad. Regardless of the network provider, a working phone line is the first thing a home needs to hook up to the Internet (See Table 8). Households earning less than $20,000 per year

Table 8. **Percent of U.S. Households with a Telephone by Income and by U.S., Rural, Urban, and Central City Areas, 1997**

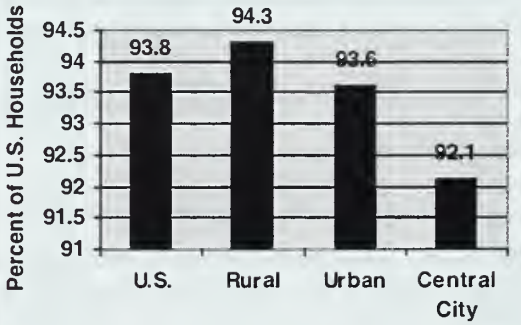
	U.S.	Rural	Urban	Central City
Under $5,000	76	74	77	75
5,000-9,999	85	85	85	85
10,000-14,999	90	90	91	90
15,000-19,999	92	92	92	92
20,000-24,999	95	96	95	94
25,000-34,999	96	97	96	96
35,000-49,999	98	98	98	97
50,000-74,999	99	98	99	98
75,000+	99	99	99	99

Source: U.S. Department of Commerce, 1998.

trail the national telephone access average of 94% (See Figure 5). Those earning less than $5,000 are the worst off – roughly one in four has no phone – with those in rural and central city areas having the lowest penetration rate (74% and 75% respectively). For decades, federal and state agencies have directed telephone companies to provide affordable service to all households. By the guiding tenet that the household telephone is

a social necessity, a complicated series of subsidies has been implemented to make universal service a reality (Pearlstein, 1995). Yet experts estimate that about one-third of young children in poverty have no working phone line in the home (Federman, 1996). In Harlem, for example, 3 out of every 10 households are without service (Blom, 1996). Clearly, households earning just enough to pay for food and shelter, if that, have no access to the rising opportunities along the Information Superhighway. Even if such a household had a computer, the computer would have to be sold first to pay the monthly phone and Internet access bills, the latter generally exceeding $140 a year.

Figure 7 shows that although the telephone penetration rate by geographic



Source: U.S. Commerce Department, 1998.

Figure 7. **Percent of U.S. Households with a Telephone by U.S., Rural, Urban, and Central City Areas, 1997**

area is fairly high, urban areas, and particularly central cities as a group, trail the national average.

There is still a significant divide among racial groups in telephone penetration. Overall, white households have a far higher telephone penetration rate (96%) than black (86%) or Hispanic (87%) households (See Table 9). This divide is

Table 9. **Percent of U.S. Households with a Telephone by Race/Origin and by U.S., Rural. Urban, and Central City Regions, 1997**

	U.S.	Rural	Urban	Central City
White Not Hispanic	96	96	96	96
Black Not Hispanic	86	83	86	86
Other Not Hispanic	93	83	94	95
Hispanic	87	85	87	85

Source: U.S. Department of Commerce, 1998.

particularly pronounced at incomes below $15,000, where the numbers are 90% for whites, 76% for blacks, and 78% for Hispanics (U.S. Commerce Department, 1998).

As for PC and modem ownership, the level of education also affects access to phone service. Those with college degrees are far more likely to have telephone service than those without any high school education (98% vs. 88%)(See Table 10).

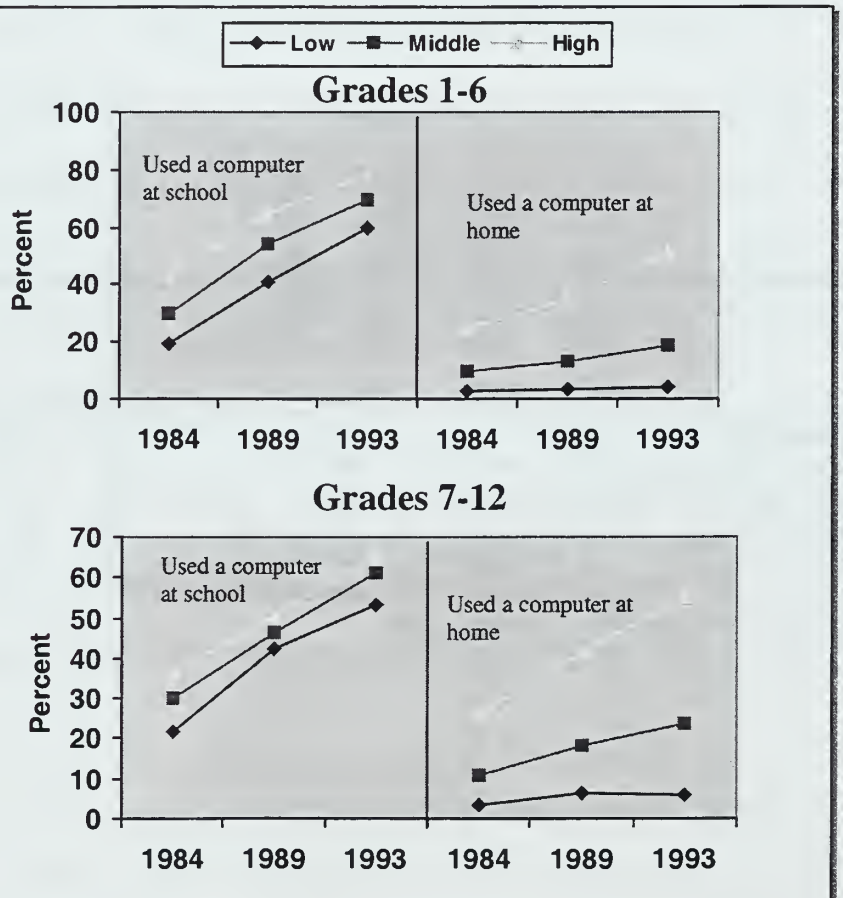
Table 10. **Percent of U.S. Households with a Telephone by Educational Attainment and by U.S., Rural. Urban, and Central City Regions, 1997**

	U.S.	Rural	Urban	Central City
Elementary	88	90	87	86
Some High School	87	89	86	84
H.S. Diploma or GED	93	94	92	91
Some College	96	96	96	94
B.A. or more	98	9	97	97

Source: U.S. Department of Commerce, 1998.

c. Student Computer Use

Computers have become an essential tool in our society (U.S. Department of Education, 1998). Early exposure to computers may help students gain the computer literacy that will be crucial for future success in the workplace (U.S. Department of Education, 1998). Access to computers at school and home allows students to retrieve information, manipulate data, and produce results efficiently and in innovative ways. Figure 8 examines the extent to which students had access to and used computers at school or at home by grade level and family income using October 1984, 1989, and 1993



Source: U.S. Bureau of the Census, October Current Population Surveys

Figure 8. **Percentage of Students who Used a Computer at School or at Home, by Grade Level and Family Income: 1984, 1989, 1993**

Current Population Survey data from the Census Bureau. Students from higher income (highest quintile) families were more likely to use a computer at home or at school than students from low income (lowest quintile) families. Between 1984 and 1993, the percentage of students who reported using a computer at school increased by similar amounts across all family income levels. However, the increase in the percentage of students who used a computer at home was higher for students from families with higher incomes.

The Internet, with its vast array of information, also broadens the learning resources available through schools. It provides teachers and students with connections to remote libraries, schools, and government agencies. Examining patterns of Internet access in schools may help determine how many students will be prepared to use this technology in the future (See Table 11). Public schools have continued to make progress

Table 11. **Percent of Public Schools and Instructional Rooms with Internet Access, by School Characteristics: 1994 to 1998**

School characteristic	Schools			Instructional rooms		
	1994	1997	1998	1994	1997	1998
All public schools	**35**	**78**	**89**	**3**	**27**	**51**
Instructional level						
Elementary	30	75	88	3	24	51
Secondary	49	89	94	4	32	52
Percent minority enrollment						
Less than 6 percent	38	84	91	6	37	57
6 to 20 percent	38	87	93	4	35	59
21 to 49 percent	38	73	91	4	22	52
50 percent or more	27	63	82	3	13	37
Percent of students eligible for free or reduced-price school lunch						
Less than 11 percent	40	88	87	4	36	62
11 to 30 percent	39	83	94	4	32	53
31 to 70 percent	33	78	91	3	27	52
71 percent or more	19	63	80	2	14	39

Source: U.S. Department of Education, National Center for Education Statistics, "Internet Access in Public Schools and Classrooms: 1994-98," Issue Brief, February 1999.

toward connecting every school to the Internet by the year 2000. Indeed, the above table shows that school connectivity has increased every year. However, schools with high minority enrollment (50 percent or more) and high poverty schools (71 percent or more eligible for free or reduced-price lunch) still lag behind lower minority enrollment and less impoverished schools for Internet access, though the gap has decreased.

While having Internet access in 89 percent of public schools is an achievement, this number does not tell us about the degree to which students actually have access to the Internet. Thus, schools with instructional rooms connected to the Internet is evaluated. Although there have been great strides made in this area, there continue to be differences in instructional room access to the Internet related to school characteristics. In 1998, public schools with 50 percent or more minority enrollment had Internet access in only 37 percent of instructional rooms, compared to 52, 59, and 57 percent in schools with 21 to 49 percent, 6 to 20 percent, and less than 6 percent minority enrollment, respectively. Similarly, public schools with 71 percent or more students in high poverty had only 39 percent of their instructional rooms connected compared to those in less poverty (52%, 53%, and 62% for 31 to 70 percent in high poverty, 11 to 30 percent , and below 11 percent, respectively) (U.S. Department of Education, 1999).

These figures do have some meaning, but they do not provide any information about whether the computers are hooked up to the Internet, and how Internet access is being used. While it is nice to say that public schools have increased their Internet access, to what extent is this access being used? If it is being used, is it being used effectively in the classroom environment?

2. Profiles of the Least Connected

According to the U.S. Department of Commerce's 1997 data and the U.S. Department of Education's 1998 data described above, the following are profiles of groups that are among the least connected:

- Rural poor – Those living in rural areas at the lowest income levels are among the least connected. Rural households earning less than $5,000 per year have the lowest telephone penetration rates (74%). Additionally, rural households earning between $5,000-$10,000 per year have the lowest computer ownership rates (8%) and online access rates (2%).
- Rural and central city minorities – Other non-Hispanic households are the least likely to have telephone service in rural areas (83%), particularly at low incomes (64%). Black and Hispanic households also have low telephone rates in rural areas (83% and 85%), especially at low incomes (74% and 72%). The lowest PC ownership rates are attributed to blacks in rural areas (15%), followed by blacks and Hispanics in central cities (17% and 16% respectively). Online access is also the lowest for black households in rural areas (6%) and central cities (6%), followed by Hispanic households in central cities (7%) and rural areas (7%).
- Schools with the highest proportion of minority enrollments (50 percent or more) and schools with the highest proportion of students eligible for free or reduced-price school lunch (71 percent or more) continue to have less Internet access and fewer instructional rooms with Internet access.

3. Conclusions

Overall, the data demonstrate that, as a nation, Americans have increasingly embraced the Information Age through electronic access in their homes (See Figure 5). Nevertheless, significant segments of the population still remain unconnected by telephone or computer. These data demonstrate that there are still pockets of "have-nots" among low income minorities, particularly in rural areas and central cities. Policymakers should continue to focus on connecting these populations so that they too can communicate by telephone and computer. These populations are among those, for example, that could most use electronic services to find jobs, housing, or other services.

There are varying degrees to which the American poor are removed from the technological future. Some can not afford a computer. Some can afford a computer but not the right one. Some can not afford to connect. Some do not have a phone line to connect the equipment they can not afford in the first place. On top of that, most would not even know why they would want to connect or to what they should connect. Economic pressure forces a state of relative technological ignorance upon poor Americans; one can not pursue knowledge of something if one does not know it exists. The result is a hardened if not uncrossable division between the technological "haves" and "have-nots."

It is also important to acknowledge a counter argument on the implications of changes in income distribution. The data sited here includes all groups of people and is used by those seeking to show deteriorating equity. The counter argument concerns movement between groups and life cycle income. This counter maintains that there is a

natural progression over one's life from lower income levels to higher income levels and finally back to lower levels in retirement. We may not be as concerned about incomes below $15,000 for students in college receiving parental support or incurring debt in anticipation of higher future incomes. Similarly, we may not be as concerned about retired individuals with incomes of $15,000 or less that have significant wealth built during their life of work in preparation for retirement. But we are very concerned about the single working parent family of four earning $15,000 in the middle of their income life cycle. Thus, taking life cycle income distribution into account would potentially show more equity than does the data presented in this chapter.

C. SOCIOECONOMIC STATUS OF NAVY ENLISTED ACCESSIONS

The Survey of Recruit Socioeconomic Backgrounds (See Appendix A), first administered in March 1989, is currently being administered on a continuing basis to randomly selected recruits at the Navy Recruit Training Command, Great Lakes, Illinois. Participants answer questions about their parents' education, employment status, occupation, and home ownership. While income is a component of socioeconomic status, research has shown that recruit-aged youths do not accurately estimate their parents' income (DoD, 1998). Thus, home ownership is included as a proxy for income in the recruit survey.

Several researchers (Gillian Stevens and Joo Hyun Cho, 1985, and Robert M. Hauser and John R. Warren, 1996) have devised a summary statistic, the Socioeconomic Index (SEI), for socioeconomic status. SEI scores summarize the differences in prestige between occupations as assessed by the education required and the earnings provided and

are one means of defining socioeconomic status. Each occupational category includes a variety of jobs with different level of prestige. The SEIs are based on individual occupations, so that a certain range of index values includes occupations of similar prestige across different occupational areas. The Total Socioeconomic Index (TSEI) incorporates income and educational data about both males and females and can be calculated for Navy recruits by using parental occupational information reported in the Survey of Recruit Socioeconomic Backgrounds. The civilian population TSEI can be calculated from information included in the Current Population Survey (CPS), conducted by the U.S. Bureau of the Census.

In Fiscal Years (FYs) 1995-1997, the Survey of Recruit Socioeconomic Backgrounds was given to 3,650, 3,675, and 3,800 Navy recruits, respectively. These recruits had no prior military service (NPS). TSEI scores reflecting the education, income, and prestige associated with different occupations were computed from responses to the survey. Table 12 compares TSEIs for fathers and mothers of USN active

Table 12. **Percent Navy TSEI Distribution for Recruit Fathers and Mothers Related to CPS Distribution Quartiles, FYs 1995-1997**

	Recruit Fathers			Recruit Mothers		
	1995	1996	1997	1995	1996	1997
Quartile 1	27	28	26	27	26	26
Quartile 2	34	32	29	26	28	28
Quartile 3	25	19	32	30	26	30
Quartile 4	15	20	13	18	20	17

Note: CPS average is 25 percent
Source: DoD *Population Representation in the Military Services,* FYs 1995-1997.

duty enlisted accessions with those of a comparable population in the CPS for FYs 1995-1997. The quartiles divide CPS parents into equal fourths with regards to TSEI. Thus, Navy parents would also be equally divided among quartiles if they were represented equally at all levels of TSEI. The results, as seen in Table 12, show that fathers of USN enlistees are considerably underrepresented in the highest quartile, almost represented in the upper-middle or 3rd quartile, and overrepresented in the lower two quartiles, throughout the years. FY97 data for recruit fathers shows an anomaly in the 3rd and 4th quartiles, explained by a particularly common job among CPS fathers that occurred at the boundary between the 3rd and 4th quartiles. Because of this, the 3rd quartile contained approximately 30 percent of the civilian population (vice 25 percent), while the 4th quartile contained 20 percent (vice 25 percent) (DoD, 1998). Thus, USN recruit fathers had a slightly higher than proportional representation in the 3rd quartile and a slightly lower representation in the 4th quartile. During the period 1995 to 1997, recruit father representation has moved closer to the distribution found in the general population.

The results for mothers of USN enlistees are somewhat different from the findings for fathers. Mothers are similarly underrepresented in the highest quartile and slightly overrepresented in the lowest and lower middle (2nd) quartiles; but mothers are more significantly overrepresented in the upper middle quartile over the years. Thus, the trend for mothers in the middle two quartiles is the converse of that for fathers, with a greater concentration for recruit mothers in the third quartile.

TSEIs are good overall indicators of socioeconomic status (SES) representation because they combine several important variables: parents' education, income (using

home ownership as a proxy), and prestige within occupations. In the next three subsections, this study identifies differences between the recruit survey population and the CPS sample with respect to parents' occupational categories, education level attainment, and home ownership for FYs 1995-1997.

1. Parents' Occupation

Tables 13, 14 and 15 compare the distribution of parents' occupational categories for USN enlistees and CPS groups. Consistent with the disparities in quartile distributions for TSEIs, USN recruit parents tend to be underrepresented in certain high prestige occupational areas. For example, the percentages of USN recruit parents who were employed as executives and professionals for FYs 1995-1997 are noticeably lower than those of CPS parents. Conversely, USN recruit parents are somewhat overrepresented in occupational categories that are typically classified as "blue collar," such as precision production/repair, service, clerical, and technician. These differences are most visible for USN recruit fathers in precision production/repair and for USN recruit mothers in clerical and service occupations.

Table 13. **Percent Distribution of Occupational Category for Parents of FY 1995 USN Recruits and Parents of 14 to 21 Year Olds From the FY 1995 CPS**

Occupation	Fathers		Mothers	
	USN	CPS	USN	CPS
Executive, Administration, & Managerial	13	19	9	12
Professional	10	9	15	19
Technicians & Related Services	3	3	4	4
Sales	3	11	11	10
Clerical & Administrative Support	4	5	28	26
Protective Services	5	3	1	1
Other Service Occupations	4	4	19	16
Farming, Forestry, & Fishing	3	4	1	2
Precision Production, Craft, & Repair	27	21	3	2
Machine Operators	6	7	5	6
Transportation	10	7	2	1
Handlers, Helpers, Laborers	3	4	2	2
Military	4	*	0	*

* Less than one-tenth of one percent.
Source: DoD POPREP FY 1995.

Table 14. **Percent Distribution of Occupational Category for Parents of FY 1996 USN Recruits and Parents of 14 to 21 Year Olds From the FY 1996 CPS**

Occupation	Fathers		Mothers	
	USN	CPS	USN	CPS
Executive, Administration, & Managerial	14	18	10	13
Professional	9	14	15	19
Technicians & Related Services	4	2	4	3
Sales	7	11	11	10
Clerical & Administrative Support	4	5	28	26
Protective Services	4	3	1	1
Other Service Occupations	4	4	19	16
Farming, Forestry, & Fishing	3	4	1	2
Precision Production, Craft, & Repair	27	21	3	3
Machine Operators	6	7	5	6
Transportation	11	8	2	1
Handlers, Helpers, Laborers	4	4	2	2
Military	3	*	0	*

* Less than one-tenth of one percent.
Source: DoD POPREP FY 1995.

Table 15. **Percent Distribution of Occupational Category for Parents of FY 1997 USN Recruits and Parents of 14 to 21 Year Olds From the FY 1997 CPS**

Occupation	Fathers		Mothers	
	USN	CPS	USN	CPS
Executive, Administration, & Managerial	15	18	10	13
Professional	8	14	15	19
Technicians & Related Services	4	2	5	4
Sales	7	10	10	10
Clerical & Administrative Support	5	5	28	25
Protective Services	5	2	1	1
Other Service Occupations	4	5	18	16
Farming, Forestry, & Fishing	3	4	1	1
Precision Production, Craft, & Repair	27	21	3	3
Machine Operators	5	2	5	6
Transportation	10	8	2	1
Handlers, Helpers, Laborers	3	3	3	2
Military	3	*	0	*

* Less than one-tenth of one percent.
Source: DoD POPREP FY 1995.

Table 16 compares the mean values for two additional socioeconomic indicators used in this study: father's and mother's education attainment level and parental home ownership. The trend from both of these indicators clearly suggests that USN recruits come from a somewhat lower socioeconomic background than found in the CPS.

2. Parents' Education

As previously noted, this study uses four levels of parental education attainment and assigns a numerical value to each level: less than high school graduate (1), high school graduate (2), some college (3), and college graduate (4). Table 16 shows that

Table 16. **Mean Parental Education Attainment Levels and Parental Home Ownership for USN Recruit Parents and Current Population Survey (CPS) Parents with 14 to 21 Year Olds, FYs 1995-1997.**

Socioeconomic Status Variables	USN			CPS		
	FY95	FY96	FY97	FY95	FY96	FY97
Father's Education[a]	2.48	2.60	2.61	2.65	2.65	2.65
Mother's Education[a]	2.41	2.52	2.54	2.51	2.54	2.55
Home Ownership[b]	1.33	1.32	1.30	1.24	1.21	1.21

[a] For cross-tabulation analysis, parental education levels are assigned the following values: (1) for less than high school graduate, (2) for high school graduates, (3) for some college, (4) for college graduates (includes greater than college graduates). Then a simple average is computed.

[b] For cross-tabulation analysis, home ownership is assigned the following values: (1) for parents who own homes, (2) for parents who rent homes, (3) for parents who pay neither rent nor mortgage, but have other housing arrangements. A mean value that approaches "one" indicates that the parent is more likely to own a home. Since these values approximate the family's income, this study assumes that parents who own a home have the highest levels of income. Then a simple average is computed.

Source: Derived from data provided by the Defense Manpower Data Center.

parents of USN recruits have generally lower average levels of education than do CPS parents. For example, USN recruit fathers have an average education attainment level for FYs 95-97 of 2.48, 2.60, and 2.61 respectively, versus a steady 2.65 for CPS fathers for the same years.

Table 17 compares the percent distribution of education attainment levels for USN recruit and CPS mothers and fathers. For example, 17, 16, and 16 percent of USN recruit mothers are non-high school graduates for FYs 1995-1997, respectively; this compares to 15, 15, and 15 percent for CPS mothers. The results in Table 17 indicate

Table 17. **Percent Distribution of Education Attainment Levels For USN Recruit Parents and Current Population Survey (CPS) Parents with 14 to 21 Year Olds, FYs 1995-1997**

EDUCATION ATTAINMENT LEVEL	FATHERS					
	USN			CPS		
	FY95	FY96	FY97	FY95	FY96	FY97
Less than HS Graduate	18	16	15	15	16	16
HS Graduate	32	32	32	31	31	32
Some College	28	28	30	26	26	25
College Graduate*	23	24	23	29	37	28
	MOTHERS					
	USN			CPS		
	FY95	FY96	FY97	FY95	FY96	FY97
Less than HS Graduate	17	16	16	15	15	15
HS Graduate	36	36	34	37	36	36
Some College	29	29	29	28	28	27
College Graduate*	18	19	21	20	21	21

*College graduate includes greater than college graduate level.

Source: Derived from data provided by the Defense Manpower Data Center.

that differences in the mean values are influenced by differences in the lowest and highest education categories. In other words, parents of USN recruits are more likely than CPS parents to be non-high school graduates and they are less likely to be college graduates.

The socioeconomic status of children and adolescents is closely related to mothers' education, fathers' education, average family income, and fathers' occupational status. Analysis of data collected for the *Profile of American Youth* study showed that mothers' education attainment approximated the effects of all four variables. Therefore,

the measure of recruit mothers' education attainment level becomes important as an indicator of quality recruits. (DoD, 1998)

3. Parents' Home Ownership

Home ownership is used as a proxy for parental income in the Survey of Recruit Socioeconomic Backgrounds and therefore in this study as well. Mean values in Table 16 indicate that parents of USN recruits are less likely to own a home than are CPS parents and more likely to have housing arrangements other than buying or renting. As such, USN recruits' parents are assumed to have lower average incomes than do their civilian counterparts. Table 18 illustrates the percent distribution of home ownership

Table 18. **Percent Distribution of Home Ownership Status For USN Recruit Parents and Current Population Survey (CPS) Parents with 14 to 21 Year Olds, FYs 1995-1997**

RESIDENCE	FATHERS					
	USN			CPS		
	FY95	FY96	FY97	FY95	FY96	FY97
Own	77	76	78	83	83	84
Rent	18	19	17	16	16	15
Other - No Rent/No Mortgage	5	5	5	1	1	1
	MOTHERS					
	USN			CPS		
	FY95	FY96	FY97	FY95	FY96	FY97
Own	69	71	72	75	77	77
Rent	26	25	24	23	22	22
Other - No Rent/No Mortgage	5	5	4	1	1	1

Source: Derived from data provided from Defense Manpower Data Center.

variables for USN recruit parents and CPS parents for FYs 1995-1997. For instance, for FYs 1995-1997 respectively, approximately 77, 76, and 78 percent of USN recruit fathers own their homes, compared with nearly 83, 83, and 84 percent of CPS fathers. Similar to

the distributions of parents' occupational categories and education levels, USN recruits' parents are underrepresented as homeowners (the highest category) and overrepresented among those who pay neither rent nor mortgage.

In summary, USN enlisted accessions come from all socioeconomic levels. However, there is a strong tendency for Navy accessions to come from families in the lower half of the status distribution. These differences are expressed in the occupations of the parents of Navy accessions, as well as discrepancies in education and home ownership. Parents of USN recruits are underrepresented in the highest occupation, education, and home ownership categories and overrepresented in the lowest categories. Parents of USN enlisted accessions are *more* likely than their CPS counterparts to be non-high school graduates, work in clerical, production, or service occupations, and neither rent nor own their homes; and they are *less* likely than CPS parents to be college graduates, work as professionals and executives, and own their homes.

Thus, linking the USN recruit parental information with the national data on computer access and usage by income and education level, yields the conclusion that Navy recruits come from lower socioeconomic backgrounds and therefore have fewer computer skills than do youths (14-21 year olds) in the general population. This will be further discussed in Chapter V.

D. RADIOMAN (RM) "A" SCHOOL

This study examined the RM "A" school in collecting data on recruit computer literacy. This is the only Navy apprentice level "A" school that teaches and uses computers. The U.S. Navy Surface Operations Ratings Enlisted Community Manager's

Homepage describes RMs (soon to be called Information Systems Technicians) as Network Centric Warriors who operate and maintain the Navy's global satellite telecommunications systems. Data from the RM "A" school regarding new student (just out of recruit training) computer literacy, setbacks, attrition, and course curriculum suggests that we are not receiving Sailors into this rating with adequate prior computer skills and knowledge. Furthermore, we are not teaching the proper materials to the RMs of the 21st century.

Computer experience, of any kind, is not a prerequisite for entering the RM rating and attending RM "A" school. The following anecdotal data concerning the computer experience of entering students was obtained from RM "A" school:

- There are 23 students per class and 90-104 classes per year. Of the 23 students, 7-10 students, or 30%-43%, raise their hands when asked if they have any computer experience at all. Most of those with some computer experience only have basic computer experience. Therefore, 57%-70% of the students entering RM "A" school, the school that begins teaching the Navy's information warrior of the future, have no prior computer experience.
- There is not time in the curriculum (70 training days) to teach basic computer skills. Those students who have difficulty with computer information, concepts, and terminology fail tests and are either attrited or setback (See Table 19).

Table 19. **RM "A" School Attrition and Setback Data**

	INPUTS	ATTRITES			SETBACKS		INPUTS MINUS	% AC[b]
		DISC[a]	AC[b]	NAC[c]	AC[b]	NAC[c]	ATTRITES	SETBACKS
FY97	1154	2	4	40	117	22	1108	10.56
FY98	1538	1	31	79	267	50	1427	18.71

[a] DISC = Disciplinary attrition
[b] AC = Academic attrition/setback
[c] NAC = Non-academic attrition/setback

Source: Data derived from information obtained from RM "A" School, Great Lakes, Illinois.

Table 19 shows that academic attrition for FYs 97 and 98 was only .36% and 2.13% of the inputs, respectively. However, the percent of academic setbacks is considerably higher (10.56% FY97 and 18.71% FY98). Most would expect the FY97 and FY98 academic setback numbers to be just the opposite since more young people are being exposed to computers and computer technology at a much earlier age then they have in the past. But is this true across all groups of people or are these two years worth of data anomalies? The data presented in this chapter suggests that this is not true for all groups of people, especially those from lower socioeconomic strata. The large increase in the percent of academic setbacks in FY98 can perhaps be explained by the continuing draw of Navy recruits from lower socioeconomic strata; because of this, they have less access to computers at school and at home, enter the Navy, and in this case, RM "A" school, with no computer skills and ultimately have a difficult time grasping the technological material being taught.

Each time a student is set back, it costs the Navy money and increases the time that that Sailor is not in the operational Fleet. Students who are setback may only be

setback one week, but others must be setback further to ensure their success in grasping the material. These data back up the anecdotal data indicating most RM "A" school students do not have computer experience or skills and therefore have trouble with the material being taught.

What is the material being taught? Table 20 outlines the basic course curriculum. This curriculum (last reviewed and approved on 6 March 1998) falls short of what we should be teaching the information warrior of the 21st century (Cebrowski, 1998). Most of what is shown in Table 20 is outdated and does not support the Navy's IT-21 initiative.

Table 20. **RM "A" School Basic Curriculum Outline**

Unit	Subject	Software/Equipment Involved
1	Basic Computer Hardware and Software	MS-DOS 5.0/386 Microcomputer Navy Software Toolkit
2	Operating Systems	MS-DOS 6.22, Windows 3.11, LINUX, 486 DX2 66
3	AIS and Communications Security	None
4	Networks	Various Static Displays, Novell Network Operating System Version 3.11, 486 DX2 66
5	Programming and Database	dBase IV
6	Maintain AIS Equipment	Norton Utilities Version 8.0, 386 Microcomputers
7	Naval Messaging System	USMTF, MD, Gateguard 486 DX2 66
8	Radio Telecommunications	Navy Standard Teletype
9	Setup and Operate Comm Equipment	Static Displays, URT-23, WSC-3 R-2368, antenna couplers, patching/switching equipment, converters, crypto equipment, Navmacs
10	Setup and Operate Comm Circuits	Same as Unit 9

Source: Derived from data provided by RM "A" School, Great Lakes, Illinois

E. YEOMAN/PERSONNELMAN (YN/PN) "A" SCHOOL

In an effort to gather additional data on recruit computer literacy, YN/PN "A" School in Meridian, Mississippi was contacted. IT skills are required for these ratings. The YN/PN "A" School responded that computer literacy is not an issue; most of their instruction is conducted with personnel publications and instructions. Students are, however, taught one lesson on the basics of MS Word. Any computer skills a YN or PN needs must be learned through On-the-Job Training (OJT). A recent graduate of the school confirmed this information. He also stated that a lot of time is spent learning things OJT. OJT is generally provided by an E-4, E-5, or E-6 YN/PN who has already mastered the skills. The common software applications and computer skills necessary to be a successful YN/PN are *not* taught at the schoolhouse, rather they are taught at the job site, while on the job.

The problem with OJT is the enormous amount of time it takes away from both the trainer and the trainee that would otherwise be spent conducting all of the other duties, tasks, and requirements of their everyday jobs. This, in turn, results in a lack of timeliness for normal work to be done, or for that hard charger, many hours of "after hours" work to get the job done.

V. DISCUSSION

This thesis emphasizes that differentials in SES backgrounds, and thus computer literacy, affects Navy training and readiness in the Information Age, however, before discussing the Navy specific data, it is necessary to take a short digression to explain some of the general population data summarized in Chapter IV. It is important to include this discussion to show the flow of the causal relationship showing that individuals in lower socioeconomic strata, which is the Navy's primary enlisted recruiting base, have less computer access and therefore lower computer skills.

A. ECONOMIC STRATIFICATION THROUGH COMPUTER STRATIFICATION

If the entering workforce is one-third the size of the previous generation, why haven't less-skilled, or non-skilled workers experienced a rise in demand similar to their skilled counterparts (Taylor, 1996)? Why have their real incomes fallen in this growing economy with fewer new workers? Specific technologies provide two answers to this question.

First, automation technology replaces mostly unskilled or semi-skilled workers. Automatic Teller Machines have replaced bank tellers. Computerized voicemail has replaced switchboard operators. Electronic toll collection has displaced turnpike workers. The automation of routine jobs has led to a number of unemployed lower skilled workers (Blom, 1996). The oversupply of such labor, in turn, keeps both job security and wages low. Indeed technological progress has mostly favored workers with

skills that technology can not replicate. As the demand for computational, analytical, and social skills rises, more efficient machines are increasingly meeting the demand for menial labor and repetitive skills.

People are born with different abilities and are raised in ways that either foster or suppress those abilities. One is naïve to believe that in any capitalist society there could be complete economic equality. Natural abilities, creativity, hard work, ingenuity, and leadership must be rewarded by society's interest to encourage the very qualities society needs.

1. Effectiveness of Computers in Education

How effective are computers in educating American children? The answer usually depends on the school and the income level of the students who attend the school. In America there are differences in computer education which parallel the differences in socioeconomic classes. In combining computers with other subjects, students in wealthier schools use word processing for creative writing, construct simulations with science programs, and further use computers to accomplish meaningful tasks in problem solving and critical thinking (Rockman, 1995). Wealthier schools are also more likely to offer both basic and Advanced Placement (AP) programming classes.

Computer use is different on the other side of the tracks. According to the 1994 Quality Education Data, students in poor schools not only have less access to computers, but the quality of computers is lower and the computer instruction students receive is different than the instruction in wealthier schools. Although a chief virtue of a computer is it's infinite patience in repetitive exercises and it's indifference to race, age, gender,

and SES, students in inner city schools tend to use the computer strictly for isolated skill development and remediation rather than as science simulators (Rockman, 1995).

Why is this so? Why is computer power idle in areas where children need it the most? Beyond the equipment disparity between lower income and upper income schools, the answer is twofold. First, more advanced educational software is often unusable on the old computers found in these schools. Second, teachers in such schools have significantly less computer experience, so their instruction can not take advantage of all the technology has to offer. Because the newest equipment and most knowledgeable teachers are concentrated in wealthier districts, computer technology serves to increase the opportunity divide. Computer technology, stratified among both homes and schools, will push more advantaged students even further ahead of the pack. Lacking universal school access, the key is home access.

2. Home Access

Many areas of business and government are pushing for a world of universal access which sidesteps the need for a modem. Connecting a direct (and high-speed) line from the Internet to every home in America is a distant goal. Raymond W. Smith, chairman of Bell Atlantic Corporation, casts the Information Age as follows: through Bell Atlantic's telephone network, videos will be available on demand, doctors will diagnose your ailment through remote television hookup, and children will learn to read through the latest interactive education software (Farhi, 1993).

But Smith's vision can only reach everyone after billions of dollars of investment, and it may never reach those households needing it the most. As he concedes, "It would

be impossible to deploy the service everywhere all at the same time. So we will go to the areas that have the highest chance of being economically successful, and if they are successful, we will move forward" (Farhi, 1993). This means that the wealthiest communities in America will first receive this technological opportunity and further augment their current skill advantage. Meanwhile, impoverished communities like Harlem and East Palo Alto may wait decades before being hooked up.

Will children without access to computers or the information superhighway be at a disadvantage? It is worth noting an instance from recent history where technology and a medium were used to expand the reach of education. "Sesame Street" was born when researchers noted that the knowledge of children entering school from poor families differed dramatically from those of children from more affluent homes (Rockman, 1995). The show's creators designed Sesame Street to narrow the gap between the haves and have-nots by raising the knowledge floor, educating at-risk children early. In theory, these children would then enter schools knowing as much as their suburban counterparts.

After the first two years of programming, researchers found that the knowledge gap between rich and poor children had widened. Subsequent studies found that children and parents in suburban homes more often watched Sesame Street, and then more often discussed the material during and after the show. Scores of suburban children increased significantly more than the scores of the urban children for whom the program was designed (Rockman, 1995).

The Sesame Street story shows that in-home programs are both effective as educational tools and potentially stratifying if used disproportionally by those who need

them the least. Because computer technology is interactive and can adjust to the needs of individual children, the potential influence of the computer and the Internet can dwarf the effects of a PBS children's show. On the road now being traveled, the poorest children may see the least of the benefits computer technology has to offer.

B. THE CAUSAL CHAIN

The data depicted in Chapter IV validates the causal chain, which is the premise of this thesis. The data show that children in a lower economic strata have less computer access and less opportunity for access both at home and at school than those children from a higher economic strata. Those from rural and central city areas were among the least connected (attempts to obtain U.S. Navy accession geographic data by urban, rural, and central city areas were unsuccessful). Less computer access at home and at school yields a cadre of high school graduates with limited computer skills. The Defense Manpower Data Center (DMDC) and Survey of Recruit Socioeconomic Backgrounds data verifies that the U.S. Navy disproportionately recruits and enlists youths from relatively lower SES backgrounds. Thus, Navy accessions are coming from that cadre of youths in the lower economic strata with limited computer skills. The results of research conducted with the RM "A" school show that more than half of the students entering each class have no computer skills or experience. This contributed to a 20 percent academic setback rate for FY98. So recruiting from these youths has, and will continue to have, significant impact on Navy training and Navy training policy.

1. Recruiting

One of the more persistent concerns about the All-Volunteer Force (AVF) has been its presumed inability to attract a representative cross section of the American population and the related issue of social equity or "fairness." Socioeconomic representation in the AVF is of key interest because of concerns that our Nation's defense might fall heavily on the poor and the underclass who are forced to turn to the military as an employer of last resort. DoD conducts an annual Survey of Recruit Socioeconomic Backgrounds among active duty and reserve enlisted accessions to assess this issue.

Many assertions about the class composition of the military have been based on impressions and anecdotes rather than on empirical data. Three systematic analyses (Cooper, 1977; Fredland and Little, 1979; Fernandez, 1989) of the socioeconomic composition of accessions have been made during the volunteer period. All found that members of the military tended to come from backgrounds that were somewhat lower in socioeconomic status than the U.S. average. This is reflected in the data presented in Chapter IV. Annual DoD POPREPs have shown the results of the Survey of Recruit Socioeconomic Backgrounds since 1990. Each year those reports show the same thing: enlisted accessions are overrepresented in the lower quartiles and underrepresented in the top quartile of socioeconomic backgrounds.

The definition of who constitutes the right young recruit has changed in concert with the growing technological demands of the Navy. Nevertheless, the basic need for superior manpower and concerns about the demographic composition in our fighting

forces have remained constant over time; the concerns will continue throughout the foreseeable future (Eitelberg, 1988).

Personnel selection pays off. The quality of the fighting force can be linked directly to the quality of recruits entering the Navy. The quality of recruits can be measured within a two-by-two matrix based on high school degree and score on the Armed Forces Qualification Test (AFQT). The highest quality recruits are high school diploma graduates (HSDGs) who score in the upper half of the AFQT (See Appendix C for category breakouts). High quality in recruits implies better individual performance and better unit performance. Investments in recruiting the right people will have an important payoff in desired military outcomes.

The Navy's recruit quality has improved since the early 1980s (Jondrow, 1995). In FY 1980, the Navy recruited 75 percent HSDGs and 51 percent in the upper mental groups – personnel classified in Categories I to IIIA on the AFQT. By FY 1995, these numbers had improved to 95 percent and 67 percent, respectively. Today, the Navy recruits about 62 percent from the very best group (HSDG and upper mental group) in contrast to only about 38 percent in 1980. Also, the Navy no longer recruits personnel from the lowest acceptable mental group (Category IV) and limits its recruiting among Category IIIB personnel to HSDGs. In spite of this excellent record of improvement, the Navy ranks last among the Services in its ability to attract high quality recruits. The Air Force recruits nearly 90 percent upper mental group HSDGs and more than 95 percent HSDGs.

To further exacerbate the Navy's situation, a letter from the Secretary of the Navy (Danzig, 1999) to all Navy Flag officers, contradicted the requirement for a recruit to have a high school diploma. He states,

> We need to recruit 1,000 enlisted Sailors every week (15% more than last year) to properly man the Fleet.... These are tough challenges that demand management attention and support.... I redirected some Navy recruiting efforts from seeking high school graduates with below average test scores to recruiting 2,600 "Proven Performers" – people who did not complete high school but have above average test scores and demonstrated success in civilian jobs.

The Navy is conceding to accept non-HSDGs. This lowers the level of formal education a young person needs to enter the Navy. But is it not the argument of this thesis that the Navy needs better educated, specifically computer or IT educated, young people? This policy appears to contradict that, as well.

Due to the nature of combat, it is essential that uniformed personnel have the capability not only to operate information systems, but also to install and maintain them. A life lost due to system downtime is an unacceptable situation, but a possibility. To avoid this possibility requires an enterprise infrastructure to support these systems. The most important part of this infrastructure is not the Asynchronous Transfer Mode switches, or fiber optic cable, or workstations. It is people; the right people. People are the most important and most overlooked link in the information infrastructure. It is essential to have proficient personnel to install, operate, and maintain these systems. So how does the Navy get these young people when the data shows it is recruiting people that have little to no IT skills?

It is important to include this discussion because of the high demand for IT workers in the civilian sector. Rabinovtiz (1999) cited a study from the Career College Association. This was the third study in two weeks on the shortage of trained high-tech workers. The three studies together "...suggest that the roots of the problem can be found in the nation's educational system (Rabinovitz, 1999)." This means that industry and the Navy are looking for high quality, IT literate "recruits" from this same technologically less capable pool. The demands of sophisticated technology and decision making skills logically presuppose a better educated Navy. Unfortunately, until there is improvement in the public education system, the required duty related IT education and training slack will have to be taken up by the Navy's schools.

2. Training Challenges

There have been many discussions (National Academy of Sciences, 1997) on current trends that increase the challenges of Navy training. The main points raised by these discussions include:

- Workplaces in all sectors have become increasingly infused with technology, requiring workers to become increasingly technology literate. The complexity of military operations has continued to increase along with the human performance needed to operate, maintain, and deploy technology, including the materiel, devices, and equipment it embodies. It could be argued that technology will decrease the complexity of human performance required by military and non-military operations, elsewhere, but this has not happened.

The demand for people trained to hold Navy jobs that are classified as technical or highly technical continues to increase.

- The quantity and variety of military systems along with the pace of their introduction have substantially increased the demands on military training to provide the people needed to operate and maintain these systems. At the end of World War I, the U.S. military fielded about 500 materiel systems; by the end of World War II, this number had increased to 2,000. Currently, about 4,000 systems are fielded or in planning.
- The technological complexity of military systems is increasing. In 1939, the volume of technical documentation required for the J-F Goose Catalina Flying Boat filled 525 pages; in 1962, the volume required by the A-6A Intruder filled approximately 150,000 pages; in 1975, the volume required for the F-14 Tomcat filled approximately 380,000 pages; documentation required by the B-1 bomber has been estimated at 1,000,000 pages. This upward trend will no doubt continue as technological advances are incorporated into military systems. (National Academy of Sciences, 1997)

Navy needs are already scientifically and technologically advanced, and the importance of technical literacy among Navy personnel will only increase in the future. The influx of information and communication technology, sensing and display techniques, computer system capabilities, material and power options, etc. has reduced shipboard manning requirements for routine duties and has improved warfighting strength. These technical capabilities substantially increase the Navy's need for

personnel who understand the warfighting potential that the new technologies bring, who understand both the opportunities and the limitations they present, who are able to choose among competing technological avenues, who can critically assess and lead technological development, and who can formulate practicable new technological visions. The Navy's education and training programs for its Sailors must address the above trends and challenges in order to have, not just adequately, but superbly trained Sailors to meet our IT-21 and JV2010 goals.

C. THE ARMED SERVICES VOCATIONAL APTITUDE BATTERY (ASVAB)

The ASVAB is a multi-aptitude test battery that is designed to measure young people's aptitudes, particularly as sophomores, juniors, or seniors in high school. It consists of ten short individual tests covering Word Knowledge, Paragraph Comprehension, Arithmetic Reasoning, Mathematics Knowledge, General Science, Auto and Shop Information, Mechanical Comprehension, Electronics Information, Numerical Operations, and Coding Speed. An aptitude is the readiness to become proficient in a type of activity, given the opportunity. This may refer to someone's capacities to learn one type of work or their potential for general training. The ASVAB measures aptitudes related to success in different jobs.

This thesis, and the data presented in Chapter IV, paid particular attention to the RM rating (soon to be called Information Systems Technicians - IT); the people in this rating are being touted as the information and network centric warriors of the 21st century. The description of the Radioman or Information Systems Technician, directly

from the Bureau of Naval Personnel's Enlisted Community Information web page, is as follows:

> Surface Radioman of the 21st century (RM): operates and maintains the Navy's global satellite telecommunications systems. They maintain the all important communications links between units at sea and stations ashore. Duties performed include: designing, installing, operating and maintaining state of the art information systems technology including local and wide-area networks, mainframe, mini and macro computer systems and associated peripheral devices; write programs to handle the collection, manipulation and distribution of data for a wide variety of applications and requirements; perform the function of a computer system analyst; operate and coordinate telecommunications systems including automated networks and the full spectrum of data links and circuits; apply diagnostic, corrective and recovery techniques to all facets of the integrated information systems; provide telecommunications and computer related training and assistance to a wide variety of personnel and serve as watch supervisors and section leaders.

The data presented in Chapter IV, particularly Table 20, shows that the Navy's RM "A" school is not teaching the materials required to even remotely satisfy this extensive job description. Furthermore, most Navy recruits entering the RM rating have few computer skills, IT experience, or technological proficiency. So how does this relate to the ASVAB?

Maximum ASVAB subtest raw scores vary from 15 to 84, depending on the subtest. ASVAB standardized raw subtest scores are adjusted to a mean of 50, a standard deviation of 10, and maximum/minimum scores of 80/20. The ASVAB Navy Composite Scores are simply the sums of the standardized scores and vary from Composite to Composite. Recruits qualify for different Navy ratings by meeting minimum standards for the relevant Navy Composite scores; these results are screening scores for different Navy occupations/ratings. The minimum required ASVAB score to be accepted into the

RM rating is a 163 (Verbal (VE) + Mathematics Knowledge (MK) + Coding Speed (CS)) (COMNAVCRUITCOMINST 1130.8E). VE is a composite of Word Knowledge (WK) and Paragraph Comprehension (PC). These four subtests make up the Navy Composite Score for the RM rating. The question to ask then is whether these are the appropriate subtests (WK, PC, MK, and CS) to set a minimum ASVAB requirement for the RM rating in light of IT-21 and the current information revolution? DMDC West's Personnel Testing department ensures that the answer to this question is "yes." But many Surface Navy officers and enlisted personnel would tend to disagree; the perception that plagues the Surface Navy is that RMs are simply Boatswain's Mates with a security clearance. Boatswain's Mates deal with ship painting, maintenance and upkeep of ship's external structure, and boat seamanship; it requires no minimum ASVAB.

There are also two problems with the current system of Navy job classification and assignment. First, the current Navy composites do not statistically differentiate levels of demand and performance predictions across jobs. Second, minimum Navy composite cutoff scores are so low that nearly every recruit qualifies for all jobs (National Academy of Sciences, 1997). Thus, the current system appears to contribute little to making effective job matches.

D. NAVY RATINGS AND COMPUTER SKILLS

In light of IT-21, JV2010, Copernicus, and simply in keeping up with information technology, all personnel in all Navy ratings (there are currently 60) need computer skills, basic IT skills. Most of these ratings use IT in one form or another; however, none of them are dedicated to supporting the IT infrastructure.

> There is today no real career path for personnel who will manage our critical information warfighting functions. Neither do we have a training program analogous to what we have for an F-18 pilot.... In order to fix this shortfall, we must start an aggressive C4ISR personnel development program, sooner rather than later. (Kaminski, 1996)

This statement is still true in 1999. Aggressive C4ISR training must start with all ratings receiving an introduction to IT/computer user skills.

It is, however, encouraging to see that the Navy has taken some steps toward improving the shortfalls in training for Network Centric Warfare. Most of these improvements, however, come at the "C" school or Journeyman level (usually at least 4 years time in service), not at the "A" school. Sailors fortunate enough to attend the IT or Information Assurance (IA) "C" schools are trained as Radio Frequency (RF) spectrum communicators, systems administrators, security managers, and LAN managers.

Additionally, the Navy has set up a web site for anyone in any rating to learn more about evolving IT skills (CNET, 1999). This Navy-wide web based Information Management Technology (IMT) training offers over 300 courses ranging from lower level end-user courses such as Word97 to high-end technical and programming training. The project was set up using a contract with Net Global. This contract started for a trial period in August 1998 and will continue through September 1999. At this time, it is unknown if this program will continue past the trial period.

VI. CONCLUSION

The benefits of computer access and the need for equalizing opportunity come together in a clarion call for universalizing computer literacy, access, and education. If we continue on the same path, lower income Americans will have a harder time exploiting the opportunities computers provide; they will also have a harder time competing for many of the top jobs in the 21st century, including Navy jobs which require computer skills. Unless the Navy starts recruiting from a different socioeconomic base, it will continue to receive recruits with low expected computer/IT skills.

A. NAVY ACCESSIONS

"We have in the service the scum of the earth as common soldiers," observed the Duke of Wellington, in 1813 (Eitelberg, 1988). Clearly, this comment can not be applied to the Navy's enlisted forces in the 1990s. Successful efforts to recruit young men and women with a high school diploma and a relatively high score on the AFQT have changed the Navy's enlisted composition. However, this study suggests that Navy recruits come from lower socioeconomic backgrounds than do their 14 to 21 year old civilian counterparts. While this may not be surprising, this study also found that most of the disparities in socioeconomic background can be explained by the fact that Sailors come from families which are underrepresented in the highest quartile and overrepresented in the lower two quartiles of socioeconomic class (See Table 12). Compared with the parents of 14 to 21 year olds in the general population, the parents of Navy recruits are more likely to be non-high school graduates and work in blue collar

occupations. Further, the parents of these recruits are less likely to own homes, earn college degrees, or work as executives or professionals. This, combined with computer access data (Tables 1–11 and Figures 1-8) suggests that Navy recruits, coming disproportionately from lower socioeconomic strata, have less access to computers at home and at school. Therefore, they are entering the Navy with less computer literacy than a young person from a higher socioeconomic strata.

The data presented in this thesis suggests there is a potential problem here, but one for which we have little information. The Navy should start looking closely at job requirements and documenting skills. Once there is a better feel for the dimensions of this issue, the Navy can decide what would be the most cost effective solution. The following possibilities should be considered in determining the most cost effective approach to recruiting, initial Navy IT training, and job assignment and compensation.

B. RECOMMENDATIONS

1. Recruiting

The 21st century is right around the corner. In addition to celebration and fanfare, it will bring continued advances in technology and its applications. Two assumptions in this thesis are that Navy personnel will be inundated with technology and information, and that fewer people will be required or available for Navy missions, but the investment in those people will be greater. On the basis of these assumptions, the following strategic objective deserves consideration if our nation's Navy is to develop and maintain the human performance and competence it will need in the 21st century:

- Recruit a higher proportion of people with above average abilities, including trained people through lateral entry.

The Navy, like all of the Services, takes a two-pronged approach to recruiting. Most enlisted recruits are high school graduates and most officers are college graduates or beyond. This model has served well in the past because most young people fell into one or the other of these two categories. In the future, however, continuing of current recruitment practices may become increasingly problematic. More and more young people are graduating with associate degrees from community colleges, and thus fall outside the two categories. This population is virtually untapped by the Navy. Currently, the Department of the Navy recruits only about 400 of the more than half a million people per year who graduate with an associate degree. Navy recruiters should consider expanding their presence in this large market of skilled labor – a market that is growing while the Navy's traditional market for personnel is decreasing. Lateral entry can provide the means by which the Navy can exploit skills and knowledge developed in the civilian economy.

Recruiting community college graduates can offer several advantages. First, on average, they will have higher test scores than high school graduates. Second, many community college graduates have skills and training that normally must be provided through the Navy's own training investments, i.e. computer skills. By recruiting community college graduates and taking advantage of their skills, it may be possible to avoid some training costs. Certainly innovative policies and procedures need to be considered to entice this population to the Navy. One possibility are provisions for

lateral entry, allowing more skilled individuals to enlist at advanced pay grades, or to advance them through the ranks more rapidly.

The Navy must also rethink its marketing strategy for other reasons. Normal initial enlistment contracts in technical ratings require a six year commitment; a normal undergraduate degree takes four years to complete. Thus, family financial resources become a factor determining the path selected by a young person. However, there are other competing options: vocational-technical (Vo-Tech) schools and company based training programs. Vo-Tech schools generally offer specific technical training and certification in two years or less. An individual can also become a Microsoft Certified Systems Engineer (MCSE) and make a salary upwards of $60,000, after an initial $10,000 investment in training or a cheaper self study program. So the Navy must compete with four potential choices for recruits (undergraduate college, community college, Vo-Tech schools, and outside technical training), all of which offer a better deal in most young people's minds.

In an effort to recruit the best and the brightest to operate and maintain the Navy's critical Information Systems, the Navy must realize that enlisting in the Navy is perhaps just an intermediate step for a young person who has other aspirations (undergraduate degree, graduate degree, etc...). Although the military currently offers enlistment incentives, such as the GI Bill, more is needed. Potential programs include a massive advertising campaign and providing more involvement with K-12 education and career counseling. In fact, when was the last time a new Navy recruiting commercial was produced? Recruiters need to be honest with prospective accessions and they also need

help from the DoD with regards to recruiting policy changes (i.e., shorter initial enlistments terms, signing bonuses, cash bonuses etc…). Recruiting individuals who will be our Network Centric Warriors should be a priority given the extreme shortages of IT specialists in the civilian sector and the growth of IT within the DoN.

2. Basic Computer Literacy

The need for basic computer/IT literacy throughout DoN is paramount. The first step in addressing this issue could be, for example, for the DoN Chief Information Officer (CIO) to launch an enterprise wide IT general literacy study for enlisted personnel by sponsoring a Navy Integrated Product Team (IPT). A bottom up approach for this initiative would be imperative, yet difficult for the Navy to do since it would cause a paradigm shift. This would ensure that all Sailors have the knowledge to understand and leverage technology before they get to the Fleet. There are currently no known efforts to address this issue at the enlisted level.

Since this thesis concentrated on computer literacy of Navy accessions, entry level computer and IT training must be addressed. Because the current ASVAB job classification and assignment system does not assess computer literacy in the strictest sense, an IT related skill aptitude test would help answer questions about who and how much training new Sailors would require. Those Sailors who score beyond a certain benchmark would be recruited into ratings and specialties such as RM/IT, CT, Network Manager, Network Maintainer and so forth (See Appendix D). All others would receive basic computer and IT skills training that would cover at least the following areas:

- Basic computing theory: OS, CPU, I/O, storage

- Introduction to applications (Microsoft): Word Processing, Browsers, E-mail, Database, Spreadsheets
- Basic computer security: authentication, validation, integrity, availability, confidentiality
- Basic network theory: internet/intranet/extranet, OSI model, client/server, protocols
- Hands on hardware configuration lab: install and remove adapters, software, drivers

The success of this training would require conducting it in a fully equipped modern lab where each Sailor would have his/her own workstation. This training should be taught during basic training and could be longer or shorter depending on budgetary and time constraints. At a minimum, this essential training should be conducted in one week. Follow-on computer and IT training should be encompassed in each rating's "A" school and all Sailors should be able to access refresher training either online (i.e., current NetGlobal contract discussed in Chapter V) or through some other electronic means (Distance Learning, VTC).

Though outside the scope of this thesis, further research should be done on what should be taught at the Navy's schoolhouses, particularly RM "A" school, if we are to truly be information and knowledge warriors.

3. Job Classification, Assignment, and Compensation

If technology reduces the requirement for numbers of Navy personnel but places greater demands on the remaining individuals, such changes will affect whom the Navy

recruits, and how they are assigned, trained, and compensated. The DoN may be able to increase the productivity of its people by better matching individual abilities, preferences, skills, and interests to the demands of the job. Such a classification and assignment system will take more fully into account the differences in levels of abilities across the population and differences among individuals to better allocate human resources to meet Navy needs. Current technology could be used to provide test composites that differentiate and predict the demands of different jobs; it would better match people to jobs.

The current military compensation system uses a single pay and allowance table for all of the Services, even though they need quite different personnel. Flexibility has been grafted onto the system through different grade structures and a myriad of special payments, such as selective reenlistment bonuses (SRBs). To recruit better people and increase the average tenure within the Navy, some changes in the compensation system will be necessary.

In the current compensation system, there is a fixed relationship between basic pay and allowances for officers and enlisted personnel. Pay raises are applied at a fixed rate for the entire pay table, and the same rate is often applied to allowances. In 1979 an E-5 with 8 years of service earned $742 per month; an O-3 with 8 years of service earned $1,570 per month (OSD, 1991). The ratio of officer pay to enlisted pay was then about 2:1. A similar comparison for 1999 military pay produces about the same ratio (O-3 with 8 = $3,485, E-5 with 8 = $1,680).

The problem with this fixed ratio is that pay practices in the civilian sector have changed substantially over the same period. The President's Council of Economic Advisors reports that the ratio of pay for college graduates (i.e., officer like workers) to pay for high school graduates (i.e., enlisted like workers) nearly doubled over the same period (Council of Economic Advisors, 1996). Since pay changes are much more dynamic in the civilian labor force than in the military, the Navy, and certainly all of the Services, need greater flexibility to compete with the civilian marketplace.

4. Bridging the Gap

Although many individuals have enjoyed and will continue to enjoy benefits from school technology, filling schools with computers will not alter social stratification. First, an effective use of classroom computers requires teachers who are both proficient in and excited about computers. Chronically low teacher salaries and the underpinning poverty of most American public schools have ensured that such teachers are the exception to the rule. Second, school computers offer a competitive edge to those students with computers at home. Research suggests that such students' familiarity and expertise with technology becomes an advantage in areas in which the technology is used. School computers can contribute significantly to a child's education, but they are not the answer to America's widening gap between the rich and the poor.

What we must do is strive, not for equality of results, but for equality of opportunity, in homes, schools, libraries, and community computer centers. What we need is a colossal but balanced investment in the Internet infrastructure. Government and business must come together with their time, their people and their resources to bring the

World Wide Web into every household and school in America. The government could greatly alleviate the opportunity gaps simply by passing legislation promoting, if not demanding, that businesses and Internet providers serve lower income communities.

APPENDIX A. DEPARTMENT OF DEFENSE SURVEY OF RECRUIT SOCIOECONOMIC BACKGROUNDS

DD-P & R(A)2035
Expires 9/22/2000

Department of Defense

SURVEY OF RECRUIT SOCIOECONOMIC BACKGROUNDS

This survey is being conducted to collect information on the socioeconomic backgrounds of new recruits entering military service. The information will become part of the group statistics provided in an annual report to Congress on this subject. The information will be used for research purposes; it will NOT become part of your personnel record and will NOT affect your military career in any way.

PRIVACY ACT STATEMENT FOR RECRUIT SOCIOECONOMIC SURVEY

AUTHORITY:	10 USC 136 and 2358; E.O. 9397.
PRINCIPAL PURPOSE(S):	Information provided on this form will be combined with information from other forms and will be included as group statistics in an annual report to Congress on population representation in the military. Personal identifiers are used to indicate active or non-active military service status. The survey will be used for analysis of socioeconomic factors in the military community.
ROUTINE USE(S):	None.
DISCLOSURE AND EFFECT(S) ON INDIVIDUAL OF NOT PROVIDING INFORMATION:	Voluntary. Failure to respond to this survey will not result in any unfavorable action to the individual.

INSTRUCTIONS FOR COMPLETING THIS QUESTIONNAIRE

- Use a No. 2 pencil.

- Make heavy black marks that will fill the circle for your answer.

INCORRECT MARKS ⊗ ✓ ⊙ O

CORRECT MARK ○ ● ○ ○

- If you are asked to "MARK ONE" response, mark the circle beside the single best answer to the question.

EXAMPLE: Are you an officer or an enlistee? (MARK ONE)

○ Officer
● Enlistee

- If you are asked to "MARK ALL THAT APPLY," you may mark more than one answer.

EXAMPLE: Are you currently: (MARK ALL THAT APPLY)

● In the Armed Forces
○ Working full-time at a non-military job
● Working part-time at a non-military job

- If you are asked to give numbers for your answer,

  — Write the numbers in the boxes at the top of the grid, making sure that the last number is in the right-hand box.

  — Fill unused boxes with zeroes.

For example, you would write 35 as 

  — Then, fill in the matching circle under each number.

For example, for 35 you would have: 

- If you are asked to write in an answer, PLEASE PRINT your answer.

1. Today's date is:

MONTH	DAY	YEAR
○ January	0 0	○ 1998
○ February	1 1	○ 1999
○ March	2 2	
○ April	3 3	
○ May	4	
○ June	5	
○ July	6	
○ August	7	
○ September	8	
○ October	9	
○ November		
○ December		

2. Mark the circle beside the location of your Recruit Training Center.

ARMY
- ○ Fort Benning, GA
- ○ Fort Jackson, SC
- ○ Fort Knox, KY
- ○ Fort Leonard Wood, MO
- ○ Fort McClellan, AL
- ○ Fort Sill, OK

NAVY
- ○ Great Lakes, IL

MARINE CORPS
- ○ Parris Island, SC
- ○ San Diego, CA (Marine Recruit Depot)

AIR FORCE
- ○ Lackland AFB, TX

COAST GUARD
- ○ Cape May, NJ

3. What is your Service branch and component?
- ○ Army National Guard
- ○ Army Reserve
- ○ Regular Army
- ○ Air National Guard
- ○ Air Force Reserve
- ○ Regular Air Force
- ○ Navy Reserve
- ○ Regular Navy
- ○ Marine Corps Reserve
- ○ Regular Marine Corps
- ○ Coast Guard Reserve
- ○ Regular Coast Guard

4. Did you enlist in the Navy TAR (Training Administration Reserve) program?
- ○ Yes
- ○ No

5. If you have ever served in the military prior to your current enlistment, in which branch(es) did you serve? (MARK ALL THAT APPLY)
- ○ Army National Guard
- ○ Army Reserve
- ○ Regular Army
- ○ Air National Guard
- ○ Air Force Reserve
- ○ Regular Air Force
- ○ Navy Reserve
- ○ Regular Navy
- ○ Marine Corps Reserve
- ○ Regular Marine Corps
- ○ Coast Guard Reserve
- ○ Regular Coast Guard

○ Never Served

6. Your Name:

Print your name here →

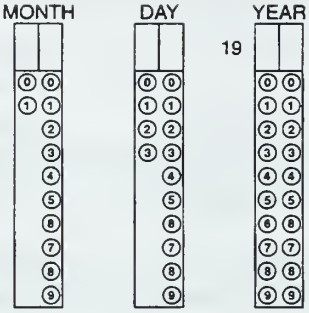
Then fill in the matching circle under each letter of your name →

LAST | FIRST | MIDDLE INITIAL

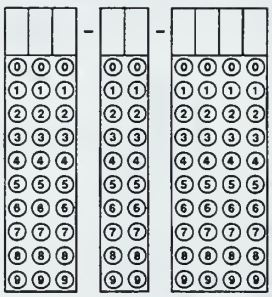
7. Date of Birth:

MONTH DAY YEAR

19



8. Social Security Number:



9. Below are some reasons why people enlist in the military. Please indicate whether each reason is true or not true for you.

I enlisted because . . .	TRUE	NOT TRUE
a. I was unemployed and could not find a job	○	○
b. I wanted to give myself a chance to be away from home on my own	○	○
c. I did not have the money to continue my education	○	○
d. The military will give me a chance to better myself in life	○	○
e. I want to travel and live in different places	○	○
f. I wanted more "life experience," and time to think about how to get what I want out of life	○	○
g. I want to get away from a personal problem	○	○
h. I want to serve my country	○	○
i. I need to improve my study habits and self discipline before continuing my education	○	○
j. I can earn more money than I could as a civilian	○	○
k. It is a family tradition to serve	○	○
l. I want to prove I can make it	○	○
m. I want to get trained in a skill that will help me get a civilian job or enhance my job	○	○
n. I want the retirement or fringe benefits	○	○
o. People I know who are in the military are doing all right	○	○
p. I could get only "dead end" jobs that would not lead to a satisfactory career	○	○
q. I can get money for a college education	○	○
r. I want additional income	○	○
s. I want to develop leadership skills	○	○

10. Which <u>one</u> of the reasons in question 9 was your <u>most important</u> reason for enlisting in the military? ⓐ ⓑ ⓒ ⓓ ⓔ ⓕ ⓖ ⓗ ⓘ ⓙ ⓚ ⓛ ⓜ ⓝ ⓞ ⓟ ⓠ ⓡ ⓢ

11. Are you male or female?

○ Male
○ Female

12. Are you: (MARK ONE)

○ Hispanic origin or descent
○ Not of Hispanic origin or descent

13. What race do you consider yourself to be? Are you: (MARK ONE)

○ American Indian or Alaskan Native
○ Black
○ Asian or Pacific Islander
○ White
○ Other race

14. What levels of education have you completed? (MARK ALL THAT APPLY)

○ Not a high school graduate
○ Have ABE (Adult Basic Education) certificate
○ Have GED (General Education Diploma)
○ Have regular high school diploma
○ Have completed vocational/technical courses <u>after high school</u>
○ Have completed some college courses <u>after high school</u>
○ Have an AA (Associate of Arts) college degree
○ Have a Bachelor's degree

15. How long ago did you graduate from high school? (MARK ONE)

- ○ I did not graduate
- ○ I'm still in high school
- ○ Less than 3 months ago
- ○ 3 to 6 months ago
- ○ 6 to 12 months ago
- ○ Over 1, but less than 2 years ago
- ○ At least 2 years ago

16. What types of schools have you attended since high school? (MARK ALL THAT APPLY)

- ○ None; I have not attended any school since high school
- ○ Vocational/technical school
- ○ Community college or 2 year college
- ○ 4 year college or university

17. Right before you first signed your enlistment contract and were sworn in, were you working at a paid job or in a family business or farm? (MARK ONE)

- ○ Yes, I was working full-time
- ○ Yes, I was working part-time
- ○ No, I was temporarily absent/on layoff from a job or business
- ○ No, I was without a job and looking for work
- ○ No, I was not working and not looking for work

18. Do you have a brother or sister who has served or is serving in the military? (MARK ONE)

○ Yes ○ No (If no, go to Question 20)

19. In which Service(s) does/did your brother(s)/sister(s) serve? (MARK ALL THAT APPLY)

- ○ Army National Guard
- ○ Army Reserve
- ○ Regular Army
- ○ Navy Reserve
- ○ Regular Navy
- ○ Coast Guard Reserve
- ○ Marine Corps Reserve
- ○ Regular Marine Corps
- ○ Air National Guard
- ○ Air Force Reserve
- ○ Regular Air Force
- ○ Regular Coast Guard

20. In what month and year did you last live with your parent(s), stepparent(s), or guardian(s)?

MONTH
- ○ January
- ○ February
- ○ March
- ○ April
- ○ May
- ○ June
- ○ July
- ○ August
- ○ September
- ○ October
- ○ November
- ○ December

YEAR
19 [ ][ ]
(0 0) (1 1) (2 2) (3 3) (4 4) (5 5) (6 6) (7 7) (8 8) (9 9)

21. What was the address of the household in which you last lived with your parent(s), stepparent(s), or guardian(s)?

Street Address

City or Town State

What is the ZIP Code at that address? → [ ][ ][ ][ ][ ]
(0 0 0 0 0) (1 1 1 1 1) (2 2 2 2 2) (3 3 3 3 3) (4 4 4 4 4) (5 5 5 5 5) (6 6 6 6 6) (7 7 7 7 7) (8 8 8 8 8) (9 9 9 9 9)

22. Did your parent(s), stepparent(s), or guardians(s) own or rent the residence in Question 21 when you lived there last? (MARK ONE)

- ○ Owned or were buying it (for example, with a mortgage)
- ○ Rented it
- ○ Occupied it without payment of rent

23. Which of these people were in your household when you last lived there with your parent(s), stepparent(s), or guardian(s) at the address in Question 21? (MARK ALL THAT APPLY)

- ○ Father
- ○ Stepfather
- ○ Male guardian

→ IF YOU MARKED ONE OF THESE, please complete SECTION A on pages 6–8.

- ○ Mother
- ○ Stepmother
- ○ Female guardian

→ IF YOU MARKED ONE OF THESE, please complete SECTION B on pages 9–11.

NOTE: If you marked one in each set, you will complete BOTH Section A and Section B.

SECTION A

- Answer the questions in Section A for the adult male you marked in Question 23.
- If no adult male is marked in Question 23, GO TO SECTION B.

24. What is the HIGHEST level of education your father (stepfather) (male guardian) has completed? (MARK ONE)

- ○ Not a high school graduate
- ○ High school graduate
- ○ Has completed vocational/technical courses after high school
- ○ Has completed some college courses after high school
- ○ Has an AA (Associate of Arts) college degree
- ○ Has a Bachelor's degree
- ○ Has a Master's degree
- ○ Has a Professional degree (e.g., M.D., D.D.S., L.L.D)
- ○ Has a Doctoral degree (e.g., Ph.D.)

25. Is your father (stepfather) (male guardian) of Spanish/Hispanic origin or descent? (MARK ONE)

○ Yes ○ No

26. Is your father (stepfather) (male guardian): (MARK ONE)

- ○ American Indian/Alaskan Native
- ○ Black/Negro/African-American
- ○ Oriental/Asian/Chinese/Japanese/Korean/Filipino/Pacific Islander
- ○ White/Caucasian
- ○ Other

27. How old is your father (stepfather) (male guardian)? (IF YOU ARE NOT SURE, BUT THINK YOU KNOW HIS AGE WITHIN ONE YEAR, PUT DOWN YOUR BEST GUESS.)

	Age in years
0 0	
1 1	
2 2	○ Don't know
3 3	
4 4	○ No longer living **GO TO QUESTION 30**
5 5	
6 6	
7 7	
8 8	
9 9	

28. Is your father (stepfather) (male guardian) currently: (MARK ONE)

- ○ Married
- ○ Divorced
- ○ Legally separated
- ○ Widowed
- ○ Single, never married

29. Is your father (stepfather) (male guardian) currently retired from a job or occupation? (MARK ONE)

○ Yes ○ No

30. What is the most recent month and year your father (stepfather) (male guardian) worked at a paid job **or** in a family business or farm? (IF HE IS CURRENTLY WORKING, WRITE THE CURRENT MONTH AND YEAR)

○ Don't know

MONTH	YEAR
○ Jan.	19
○ Feb.	0 0
○ Mar.	1 1
○ Apr.	2 2
○ May	3 3
○ June	4 4
○ July	5 5
○ Aug.	6 6
○ Sept.	7 7
○ Oct.	8 8
○ Nov.	9 9
○ Dec.	

31. Is your father (stepfather) (male guardian) currently working at a paid job **or** in a family business or farm? (MARK ONE ONLY)

- ○ Yes, he is currently working.
  IN QUESTIONS 32–38, DESCRIBE HIS CURRENT JOB. IF HE HAS MORE THAN ONE JOB, DESCRIBE THE ONE AT WHICH HE WORKS THE MOST HOURS.
- ○ No, he is temporarily absent/on layoff from a job or business.
  IN QUESTIONS 32–38, DESCRIBE THE JOB FROM WHICH HE IS TEMPORARILY ABSENT OR ON LAYOFF.
- ○ No, he is without a job and looking for work.
  IN QUESTIONS 32–38, DESCRIBE THE LAST FULL-TIME JOB HE HAD FOR TWO WEEKS OR MORE.
- ○ No, he is not working now and not looking for work.
  IN QUESTIONS 32–38, DESCRIBE THE LAST FULL-TIME OR PART-TIME JOB HE HELD.
- ○ No, he is no longer living.
  IN QUESTIONS 32–38, DESCRIBE THE LAST FULL-TIME OR PART-TIME JOB HE HELD.
- ○ No, he never worked for pay.
  GO TO QUESTION 39
- ○ Don't know
  GO TO QUESTION 39

32. In your father's (stepfather's) (male guardian's) most recent job, was he:

- ○ Employee of private company, business, or individual, working for wages, salary or commissions
- ○ Federal government employee
- ○ State government employee
- ○ Local government employee (city, county, town employee, etc.)
- ○ Self-employed in own business, professional practice, or farm
- ○ Working without pay in family business or farm
- ○ Don't know

33. For whom does (did) your father (stepfather) (male guardian) work?
(Name of company, business organization, or other employer)

Please print

Don't know ○

34. What kind of business or industry is (was) this?
(For example: Hospital, newspaper publishing, mail order house, auto engine manufacturing, breakfast cereal manufacturing)

Please print

Don't know ○

35. What kind of work is (was) he doing–what is his job called?
(For example: Doctor, personnel manager, supervisor of order department, gasoline engine assembler, grinder operator)

Please print

Don't know ○

36. What are (were) your father's (stepfather's) (male guardian's) most important activities or duties **at this job?**
(For example: Patient care, directing hiring policies, supervising order clerks, assembling engines, operating grinding mill)

Please print

Don't know ○

37. How long has (did) your father (stepfather) (male guardian) worked for this employer? (MARK ONE)

- ○ Less than 3 months
- ○ At least 3 months, but less than 6 months
- ○ At least 6 months, but less than 1 year
- ○ At least 1 year, but less than 3 years
- ○ At least 3 years, but less than 10 years
- ○ At least 10 years

38. Which of the categories below comes closest to describing his job?
(READ ENTIRE LIST, THEN MARK ONE)

- ○ CLERICAL OR ADMINISTRATIVE SUPPORT (secretary, bookkeeper, mailroom supervisor, mail clerk, keypunch operator, bank teller, etc.)
- ○ CONSTRUCTION, MINING, OR DRILLING (skilled construction worker such as carpenter, plumber supervisor, roofer; also miner, well driller, etc.)
- ○ CRAFT OR PRECISION PRODUCTION (tool-and-die maker, cabinet maker, engraving supervisor, printer, gem cutter, etc.)
- ○ EXECUTIVE, ADMINISTRATIVE, OR MANAGERIAL (company executive, personnel manager, accountant, school principal, public official, etc.)
- ○ FARMING, FORESTRY, OR FISHING (farm owner, farmworker, field supervisor, gardener; logger; fisherman, etc.)
- ○ LABORER, HELPER, HANDLER, EQUIPMENT CLEANER (unskilled construction worker, dock worker, machinist helper, stock handler, car washer, etc.)
- ○ MACHINE OPERATOR, ASSEMBLER, OR INSPECTOR (punch press operator, sewing machine operator, mill supervisor; furniture assembler; meat inspector, etc.)
- ○ MECHANIC OR REPAIRER (automobile or aircraft mechanic, maintenance supervisor, television repairer, locksmith, etc.)
- ○ MILITARY SERVICE in the Active Duty Army, Navy, Air Force, Marine Corps, or Coast Guard.
- ○ PROFESSIONAL (doctor, registered nurse, lawyer, engineer, scientist, teacher, social worker, etc.)
- ○ PROTECTIVE SERVICE (police officer, firefighter, security guard, etc.)
- ○ SALES (real estate or insurance agent, sales clerk, retail store manager, automobile salesman, etc.)
- ○ SERVICE OCCUPATION (waitress, cook, beautician, housekeeper, janitor supervisor, child care worker, hospital orderly, etc.)
- ○ TECHNICIAN (computer programmer, dental hygienist, licensed practical nurse, laboratory technician, air traffic controller, etc.)
- ○ TRANSPORTATION OR MATERIAL MOVING (truck or bus driver, railroad conductor, barge captain, bulldozer operator, etc.)

- ○ DON'T KNOW

- ○ NEVER WORKED

39. Did your father (stepfather) (male guardian) ever serve in the military? (MARK ONE)

- ○ Yes
- ○ No (Go to Section B)

40. How long did your father (stepfather) (male guardian) serve on active duty? (MARK ONE)

- ○ No time, he only served in the Reserves
- ○ Less than 8 years
- ○ At least 8 years, but less than 20 years
- ○ 20 years or more

41. In which Service(s) did your father (stepfather) (male guardian) serve? (MARK ALL THAT APPLY)

- ○ Army National Guard
- ○ Army Reserve
- ○ Regular Army
- ○ Navy Reserve
- ○ Regular Navy
- ○ Coast Guard Reserve
- ○ Marine Corps Reserve
- ○ Regular Marine Corps
- ○ Air National Guard
- ○ Air Force Reserve
- ○ Regular Air Force
- ○ Regular Coast Guard

END OF SECTION A

SECTION B

- Answer the questions in Section B for the adult female you marked in Question 23.
- If no adult female is marked in Question 23, your questionnaire is now complete. Thank you for participating.

42. What is the HIGHEST level of education your mother (stepmother) (female guardian) has completed? (MARK ONE)

- ○ Not a high school graduate
- ○ High school graduate
- ○ Has completed vocational/technical courses after high school
- ○ Has completed some college courses after high school
- ○ Has an AA (Associate of Arts) college degree
- ○ Has a Bachelor's degree
- ○ Has a Master's degree
- ○ Has a Professional degree (e.g., M.D., D.D.S., L.L.D)
- ○ Has a Doctoral degree (e.g., Ph.D.)

43. Is your mother (stepmother) (female guardian) of Spanish/Hispanic origin or descent? (MARK ONE)

○ Yes ○ No

44. Is your mother (stepmother) (female guardian): (MARK ONE)

- ○ American Indian/Alaskan Native
- ○ Black/Negro/African-American
- ○ Oriental/Asian/Chinese/Japanese/Korean/Filipino/Pacific Islander
- ○ White/Caucasian
- ○ Other

45. How old is your mother (stepmother) (female guardian)? (IF YOU ARE NOT SURE, BUT THINK YOU KNOW HER AGE WITHIN ONE YEAR, PUT DOWN YOUR BEST GUESS.)

	Age in years
0 0	
1 1	
2 2	○ Don't know
3 3	
4 4	○ No longer living **GO TO QUESTION 48**
5 5	
6 6	
7 7	
8 8	
9 9	

46. Is your mother (stepmother) (female guardian) currently: (MARK ONE)

- ○ Married
- ○ Divorced
- ○ Legally separated
- ○ Widowed
- ○ Single, never married

47. Is your mother (stepmother) (female guardian) currently retired from a job or occupation? (MARK ONE)

○ Yes ○ No

48. What is the most recent month and year your mother (stepmother) (female guardian) worked at a paid job **or** in a family business or farm? (IF SHE IS CURRENTLY WORKING, WRITE THE CURRENT MONTH AND YEAR)

○ Don't know

MONTH
- ○ Jan.
- ○ Feb.
- ○ Mar.
- ○ Apr.
- ○ May
- ○ June
- ○ July
- ○ Aug.
- ○ Sept.
- ○ Oct.
- ○ Nov.
- ○ Dec.

YEAR
19 [ ][ ]
0 0
1 1
2 2
3 3
4 4
5 5
6 6
7 7
8 8
9 9

49. Is your mother (stepmother) (female guardian) currently working at a paid job **or** in a family business or farm? (MARK ONE ONLY)

- ○ Yes, she is currently working.
  IN QUESTIONS 50–56, DESCRIBE HER CURRENT JOB. IF SHE HAS MORE THAN ONE JOB, DESCRIBE THE ONE AT WHICH SHE WORKS THE MOST HOURS.
- ○ No, she is temporarily absent/on layoff from a job or business.
  IN QUESTIONS 50–56, DESCRIBE THE JOB FROM WHICH SHE IS TEMPORARILY ABSENT OR ON LAYOFF.
- ○ No, she is without a job and looking for work.
  IN QUESTIONS 50–56, DESCRIBE THE LAST FULL-TIME JOB SHE HAD FOR TWO WEEKS OR MORE.
- ○ No, she is not working now and not looking for work.
  IN QUESTIONS 50–56, DESCRIBE THE LAST FULL-TIME OR PART-TIME JOB SHE HELD.
- ○ No, she is no longer living.
  IN QUESTIONS 50–56, DESCRIBE THE LAST FULL-TIME OR PART-TIME JOB SHE HELD.
- ○ No, she never worked for pay.
  GO TO QUESTION 57
- ○ Don't know
  GO TO QUESTION 57

50. In your mother's (stepmother's) (female guardian's) most recent job, was she:

- ○ Employee of private company, business, or individual, working for wages, salary or commissions
- ○ Federal government employee
- ○ State government employee
- ○ Local government employee (city, county, town employee, etc.)
- ○ Self-employed in own business, professional practice, or farm
- ○ Working without pay in family business or farm
- ○ Don't know

51. For whom does (did) your mother (stepmother) (female guardian) work? (Name of company, business organization, or other employer) Please print	Don't know ○
52. What kind of business or industry is (was) this? (For example: Hospital, newspaper publishing, mail order house, auto engine manufacturing, breakfast cereal manufacturing) Please print	Don't know ○
53. What kind of work is (was) she doing–what is her job called? (For example: Doctor, personnel manager, supervisor of order department, gasoline engine assembler, grinder operator) Please print	Don't know ○
54. What are (were) your mother's (stepmother's) (female guardian's) most important activities or duties **at this job**? (For example: Patient care, directing hiring policies, supervising order clerks, assembling engines, operating grinding mill) Please print	Don't know ○

55. How long has (did) your mother (stepmother) (female guardian) worked for this employer? (MARK ONE)

- ○ Less than 3 months
- ○ At least 3 months, but less than 6 months
- ○ At least 6 months, but less than 1 year
- ○ At least 1 year, but less than 3 years
- ○ At least 3 years, but less than 10 years
- ○ At least 10 years

56. Which of the categories below comes closest to describing her job?
(READ ENTIRE LIST, THEN MARK ONE)

- ○ CLERICAL OR ADMINISTRATIVE SUPPORT (secretary, bookkeeper, mailroom supervisor, mail clerk, keypunch operator, bank teller, etc.)
- ○ CONSTRUCTION, MINING, OR DRILLING (skilled construction worker such as carpenter, plumber supervisor, roofer; also miner, well driller, etc.)
- ○ CRAFT OR PRECISION PRODUCTION (tool-and-die maker, cabinet maker, engraving supervisor, printer, gem cutter, etc.)
- ○ EXECUTIVE, ADMINISTRATIVE, OR MANAGERIAL (company executive, personnel manager, accountant, school principal, public official, etc.)
- ○ FARMING, FORESTRY, OR FISHING (farm owner, farmworker, field supervisor, gardener; logger; fisherman, etc.)
- ○ LABORER, HELPER, HANDLER, EQUIPMENT CLEANER (unskilled construction worker, dock worker, machinist helper, stock handler, car washer, etc.)
- ○ MACHINE OPERATOR, ASSEMBLER, OR INSPECTOR (punch press operator, sewing machine operator, mill supervisor; furniture assembler; meat inspector, etc.)
- ○ MECHANIC OR REPAIRER (automobile or aircraft mechanic, maintenance supervisor, television repairer, locksmith, etc.)
- ○ MILITARY SERVICE in the Active Duty Army, Navy, Air Force, Marine Corps, or Coast Guard.
- ○ PROFESSIONAL (doctor, registered nurse, lawyer, engineer, scientist, teacher, social worker, etc.)
- ○ PROTECTIVE SERVICE (police officer, firefighter, security guard, etc.)
- ○ SALES (real estate or insurance agent, sales clerk, retail store manager, automobile salesman, etc.)
- ○ SERVICE OCCUPATION (waitress, cook, beautician, housekeeper, janitor supervisor, child care worker, hospital orderly, etc.)
- ○ TECHNICIAN (computer programmer, dental hygienist, licensed practical nurse, laboratory technician, air traffic controller, etc.)
- ○ TRANSPORTATION OR MATERIAL MOVING (truck or bus driver, railroad conductor, barge captain, bulldozer operator, etc.)

- ○ DON'T KNOW
- ○ NEVER WORKED

57. Did your mother (stepmother) (female guardian) ever serve in the military? (MARK ONE)

○ Yes ○ No (End of questionnaire)

58. How long did your mother (stepmother) (female guardian) serve on active duty? (MARK ONE)

- ○ No time, she only served in the Reserves
- ○ Less than 8 years
- ○ At least 8 years, but less than 20 years
- ○ 20 years or more

59. In which Service(s) did your mother (stepmother) (female guardian) serve? (MARK ALL THAT APPLY)

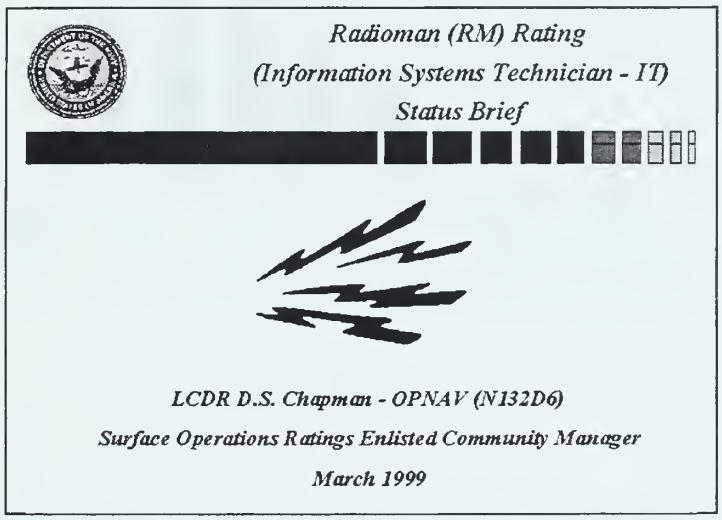
- ○ Army National Guard
- ○ Army Reserve
- ○ Regular Army
- ○ Navy Reserve
- ○ Regular Navy
- ○ Coast Guard Reserve
- ○ Marine Corps Reserve
- ○ Regular Marine Corps
- ○ Air National Guard
- ○ Air Force Reserve
- ○ Regular Air Force
- ○ Regular Coast Guard

END OF SECTION B

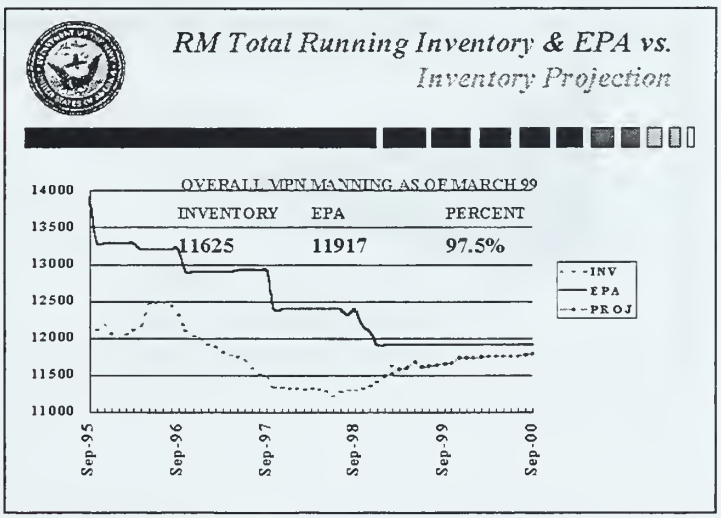
APPENDIX B. RADIOMAN (RM) RATING (INFORMATION SYSTEMS TECHNICIAN – IT) STATUS BRIEF

The following is the manpower status brief of the RM rating as of March 1999. It shows the Enlisted Programmed Authorization (EPA), which is a recurring, published document summarizing the enlisted billet authorizations, by rating, in the Total Force Manpower Management System by current fiscal year, with the actual inventory of RMs.

Slide 1



Slide 2



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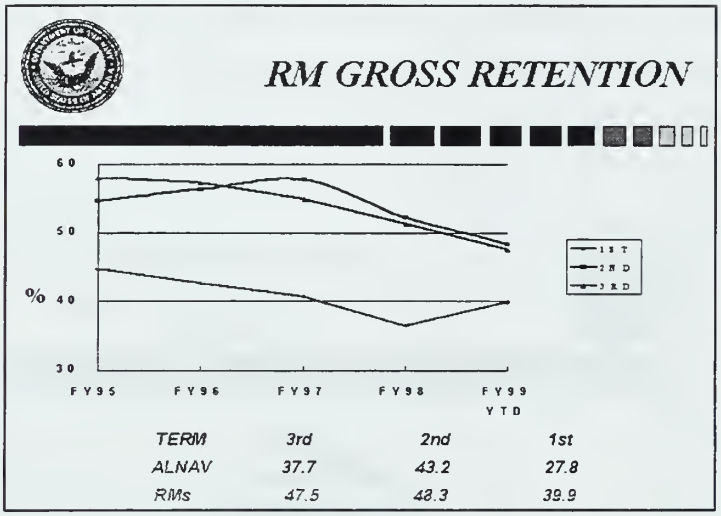

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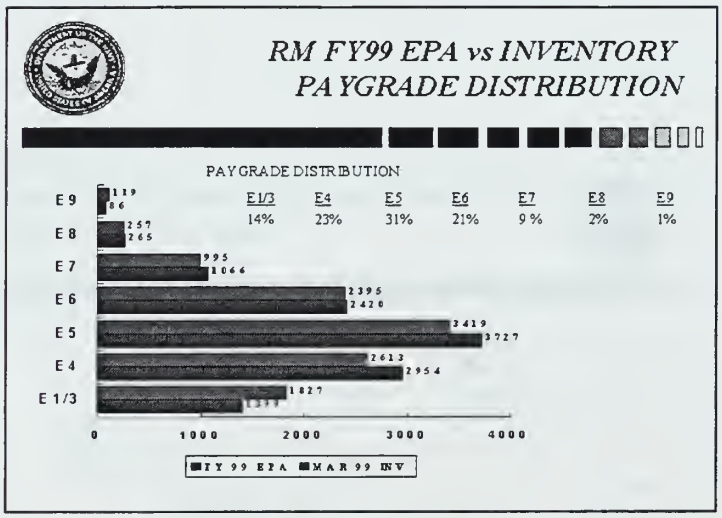
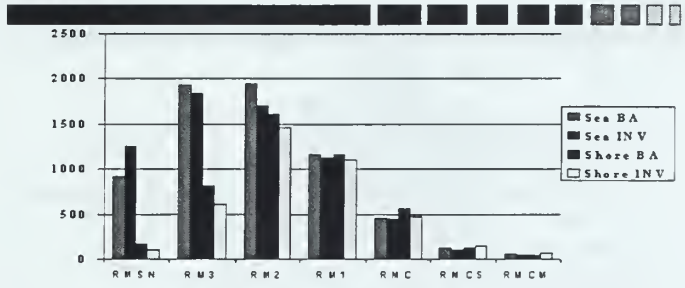


Slide 5

RM SEA/SHORE MANNING



E1-E4:	96%	E5-E6:	96%	E7-E9:	99%	Overall:	97.5%
SEA	105%		94%		93%		98.7%
SHORE	67%		94%		94%		87.8%

Slide 6

RM Community Management Actions

- CREO — *First Term-1* — *Careerist-2*

- SEA/SHORE ROTATION:

E1-3	*60/24*	*E7*	*42/36*
E4	*60/36*	*E8*	*39/36*
E5	*42/36*	*E9*	*39/36*
E6	*45/36*		

- SRB:
  - *RM-0000: Zone A 4.0*
  - *RM-2735: Zone A 4.5; Zone B 3.0; Zone C 2.0*
  - *RM-2780: Zone A 5.0; Zone B 3.0; Zone C 2.0*
  - *RM-2379: Zone A 4.0; Zone B 2.0*

Slide 7

RM Community Management Actions (Cont'd)

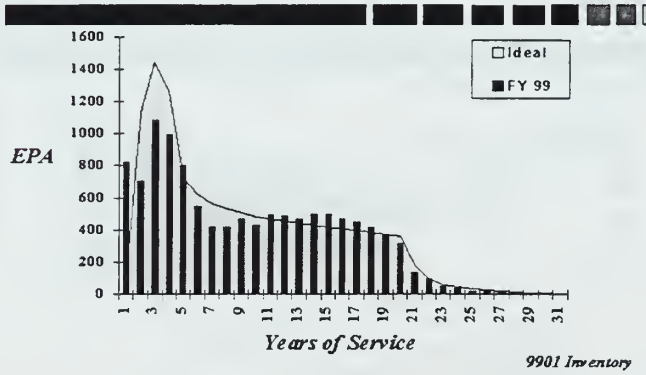
SDAP None

MANAGEMENT ACTIONS:

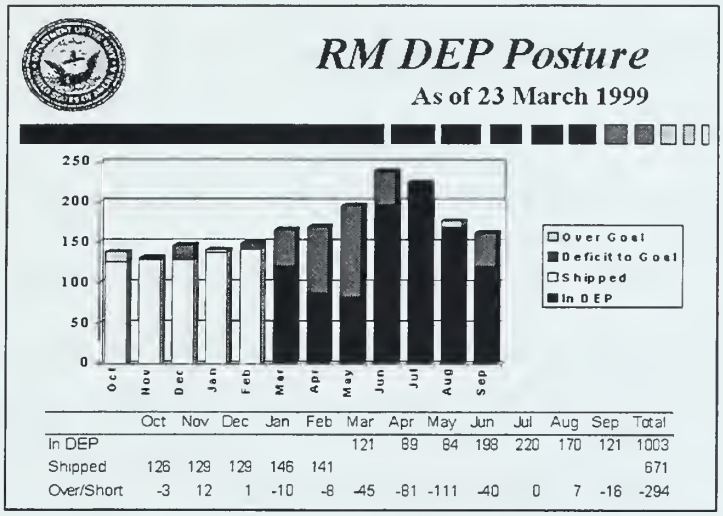
- Increased SRB across all zones.
- Advancement opportunity well above ALNAV averages for all paygrades.
- Rating open to GENDETs.
- Taking NAVETs/OSVETs E-1 through E-5.
- Enlistment Bonus increased to $7,000 during off-peak months. EB remains at $2,000 for Jun, Jul, Aug, & Sep.

Slide 8

RM FY99 Ideal vs. Inventory



Slide 9



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
In DEP						121	89	84	198	220	170	121	1003
Shipped	126	129	129	146	141								671
Over/Short	-3	12	1	-10	-8	-45	-81	-111	-40	0	7	-16	-294

APPENDIX C. ARMED FORCE QUALIFICATION TEST (AFQT) CATEGORIES

The AFQT is comprised of four ASVAB subtests: Arithmetic Reasoning, Mathematics Knowledge, Word Knowledge, and Paragraph Comprehension. The AFQT, a general measure of trainability and a predictor of on-the-job performance, is the primary index of recruit aptitude. AFQT scores, expressed on a percentile scale, reflect an applicant's standing relative to the national population of men and women 18 to 23 years of age. The scores are grouped into five categories shown below. Persons who score in Categories I and II tend to be above average in trainability; those in Category III, average; those in Category IV, below average; and those in Category V, markedly below average. By law, Category IV and V applicants who have not graduated from high school are not eligible for enlistment (DoD, 1998). Over and above these legal restrictions, each military service prescribes its own aptitude and education criteria for eligibility. Each service uses combinations of ASVAB test scores to determine an applicant's aptitude and eligibility for different military occupations.

AFQT Category	Percentile Score Range
I	93-99
II	65-92
IIIA	50-64
IIIB	31-49
IV	10-30
V	1-9

APPENDIX D. PROPOSED DEPARTMENT OF THE NAVY (DoN) IT SPECIALIST FUNCTIONAL COMPETENCIES

The four categories outlined below represent broad areas of knowledge specifically considered for enlisted IT functions. These categories are not platform specific. It is assumed that larger ship and shore commands will require more personnel of each category. There may also be specialties required on larger ships and shore installations and not on smaller ones due to equipment configurations. Some of the tasks described are currently being performed by various existing ratings in the Navy.

1. Network Managers

These individuals will be the network managers in the traditional standards sense. They will play a major role in reducing superfluous help desk/trouble desk calls by early detection and isolation of problems. Responsibilities would include but are not limited to:

- Fault management
- Security management
- Performance management
- PKI distribution management
- Trouble ticket management
- DNS/DHCP operations maintenance
- Management of RF-WAN internals

2. Network Installer/Maintainer

This group primarily comprises individuals from existing ratings. They would work closely with group one and three to ensure end to end system interoperability. Their responsibilities would include but not limited to:

- Structured wiring plant installation and maintenance
- Router/hub/switch installation, configuration, and maintenance
- Cable plant maintenance
- Installation of LAN cable/connectors
- Installation of ADSL equipment, modems, link encryption
- Installation/maintenance of shipboard telephony
- Hardware troubleshooting

3. End System Configuration Managers

This group would work closely with group one but would have more end user interface. Tasks would included but not limited to:

- User account administration
- OS/network protocol configuration for end systems (i.e., client/server)
- Install network servers (DNS, DHCP, Mail, File, Web)
- Install and configure client OS including local configuration
- Install and configure C4I systems
- Software installation, configuration, and management
- License management

4. Information Operators

These are the customers that the other three groups seek to support; in essence all other personnel on the ship or at the command. Specifically, it must include IT intensive application users for systems such as GCCS, JMCIS, and GCSS. It also will include users of other shipboard or command stand alone systems that may be planned for integration into a single shipboard or command LAN. These users could be traditional administrative or C4I personnel. These users would receive the basic IT literacy training described in Chapter VI and hopefully many would pursue follow IT training, either Navy training, public or private.

APPENDIX E. NAVY ACTIVE DUTY ENLISTED DEMOGRAPHICS

The following table represents the Navy's active duty enlisted demographics as of 31 December 1998.

	White	Black	Hispanic	Other	Total
Male	183202	52210	25333	23605	284350
PCT	89.00	79.76	85.56	89.39	86.87
Female	22641	13251	4277	2802	42971
PCT	11.00	20.24	14.44	10.61	13.13
Total	205843	65461	29610	26407	327321
Total PCT	**62.89%**	**20.00%**	**9.05%**	**8.07%**	**100.00%**

Source: Special Assistant for Minority Affairs to the Chief of Naval Personnel.

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